Imperial Bureau of Plant Breeding and Genetics

Plant Breeding Abstracts

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Note.—Initialled abstracts are written by the following:—

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* General studies, see also individual crops.

Plant Breeding Abstracts.

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Part 1. Empire Section

STATISTICS 519

293. COLCORD, C. G. and DEMING, L. S. 519.24
The one-tenth per cent level of 'z'.
Sankhyā : Indian J. Statist. 1936 : **2** : 423–24.

BANERJEE, S. K.
The one-tenth per cent level of the ratio of variances.
Sankhyā : Indian J. Statist. 1936 : **2** : 425–28.

Two new tables for testing significance in analysis of variance are here presented. The first is a full table of the 0·1 per cent points of the distribution of Fisher's z, an extract from which has been published in the sixth edition of Fisher's "Statistical methods for research workers"; the second is a transformation of the table so that ratios of variances may be read off directly. J. W.

294. PITMAN, E. J. G. 519.24
Significance tests which may be applied to samples from any populations. II. The correlation co-efficient test.
Suppl. J. Roy Statist. Soc. 1937 : **4** : 225–32.

A practical test of dependence of one variate on another is proposed which is based on the correlation coefficient estimated from a sample, but which makes no assumptions about the nature of the frequency law of the population which is sampled. It is shewn that an approximate form of the test will give the same result as the usual test based on the assumption of the normal law. The validity of the approximation is determined by the sample values alone. J. W.

295. DAY, B., and
FISHER, R. A. 519.24
The comparison of variability in populations having unequal means. An example of the analysis of covariance with multiple dependent and independent variates.
Ann. Eugen., Camb. 1937 : **7** : 333–48.

For populations having the same mean value in any measurement, comparisons of variability may be made directly, using the standard deviations or variances. When, however, the populations to be compared differ also in their means, such comparisons may not provide what is wanted. This point is dealt with in the present paper, and illustrated from data of natural populations of *Plantago maritima*. The method used is an analysis of covariance where there are a number of dependent as well as independent variates, and the paper furnishes a useful example of the method of analysis to be performed in such cases. J. W.

296. HALDANE, J. B. S. 519.24
The exact value of the moments of the distribution of χ^2, used as a test of goodness of fit, when expectations are small.
Biometrika 1937 : **29** : Pts. I & II : 133–43.

Exact expressions are found for the mean and the first four moments of the distribution of χ^2 in cases where it is used as a test of goodness of fit, that is to say in (m x n)-fold tables with $m(n-1)$ degrees of freedom. The results make it possible to apply the χ^2 test without restriction on the size of the samples or the numbers to be expected. J. W.

297. 575:633
633.00.15

A review of agricultural research and investigation in the Colonial Empire.

1936 : Pp. 156.

Based largely on notes supplied by Colonial Departments of Agriculture and upon their Annual Reports, this publication gives a valuable survey of agricultural research in the Colonial Empire, including plant breeding work. It was originally prepared for the Colonial Advisory Council of Agriculture and Animal Health.

298. BELL, G. D. H. 575:633

Crops and plant breeding.

Fmrs' Guide Agric. Res. 1936 : 1–51.

The topics reviewed in this annual survey include: modern tendencies in plant breeding procedure; wheat quality, diseases and other problems; barley breeding, varieties and quality in malting barley and also the possibility of breeding six-row barleys for Great Britain; huskless oats, the choice of oat varieties as affected by the level of productivity and breeding; new varieties of hops; and the variety trials conducted by the National Institute of Agricultural Botany with sugar beet, spring oats and potatoes.

299. FRANKEL, O. H. 575:633

Recent developments in plant breeding.

Proc. 5th Conf. N.Z. Grassland Ass. (1936) : 1937 : 198–204.

The author discusses briefly the use of world collections, interspecific crosses, polyploidy and induced mutations, with reference to American, German and Russian work.

300. HUDSON, P. S. 575:633

Genetics in its application to plant breeding.

Biol. Rev. 1937 : **12** : 285–319.

The topics covered in this survey are single-plant selection, geographical distribution, distant hybridization, amphidiploidy, physiological specialization in parasitic fungi, breeding for disease resistance, induced mutations, vernalization, breeding for earliness and finally, yield.

301. DATTA, R. M. 575:633(51)

Agricultural research in China.

Curr. Sci. 1937 : **6** : 36–37.

Breeding work is included in this brief survey. In addition to the work on wheat (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 938) the rice breeding work is outlined. This includes extensive selection from local types, varietal trials of Chinese and foreign varieties, regional tests and hybridization. The effect of length of day on flowering has been studied and it appears possible to make early, medium and late varieties flower at the same time for crossing. The technique of field experimentation with rice is being studied.

Selection from local forms, hybridization and variety tests are conducted in connexion with the improvement of cotton.

Improved varieties of potato and sweet potato have been produced.

302. 575:633(67.6)
633.00.15(67.6)

Report by Sir Frank Stockdale, K.C.M.G., C.B.E., on his visit to East Africa, January-March, 1937.

Colon. Adv. Coun. Agric. & Anim. Health 1937 : C.A.C. 345 : Pp. 117.

The report includes *inter alia* remarks on the experimental work in the places visited, Zanzibar, Tanganyika, Uganda and Kenya. It is recommended that more attention should be paid to work on native food crops, in particular to the development of mosaic-resistant varieties of cassava, of early maturing strains of grains and pulses and of strains of sorghum resistant to the parasitic plant *Striga hermonthica*.

A section of the report is devoted to the work of the East African Agricultural Research Station at Amani and the following recommendations with regard to plant breeding are made: work on the discovery, selection and breeding of varieties of cassava immune, resistant or tolerant to mosaic disease should be continued in collaboration with East African Departments of Agriculture, contact being maintained with workers on this problem in West Africa and other parts of the Tropics; the Geneticist should continue work on selection and breeding of robusta coffee and the cytological investigations of robusta and arabica coffee, but the selection and breeding work with arabica coffee should be handed over to the coffee stations established in Kenya and Tanganyika, as Amani conditions are not suited to a satisfactory development of arabica coffee; the breeding and testing of new strains of sisal should be continued and further developed on the Mlingano Sisal Experiment Station; selection and breeding work should be undertaken in connexion with the investigations on *Cinchona*, *Aleurites montana* and *Derris*; the new Director of Amani should draw up a programme in connexion with the improvement of native food crops, in collaboration with the Departments of Agriculture of those dependencies which contribute to the upkeep of Amani.

303. Broadfoot, R. C. 575:633:061.6(54.8)
College of Agriculture and Agricultural Research Institute, Coimbatore.
Curr. Sci. 1937 : **6** : 188–92.
Breeding and genetical work on the following crops is in progress at the Institute: cotton, rice, sorghum and millets, groundnut, coconut, sesamum, castor oil plant and Bengal gram (*Cicer*) and red gram (*Cajanus*).

304. Pal, B. P. 575:633:581.9
The search for new genes.
Agric. Live-Stk. India 1937 : **7** : 573–78.
A popular article, explaining the importance for plant breeding of the diversity existing at the centres of origin of the different crops.

GENETICS 575.1

305. MacBride, E. W. 575.1
Mendel, Morgan and genetics.
Nature, Lond. 1937 : **140** : 348–50.
The author endeavours to shew that the chromosome theory of heredity is invalid, being based on incorrect assumptions.

306. 575.1:582
Genetics and taxonomy.
Nature, Lond. 1937 : **140** : 572–73.
A brief report of a discussion on this topic held at the British Association's meeting at Nottingham, 1937.

307. Mather, K. 575.11:519.24
The analysis of single-factor segregations.
Ann. Eugen., Camb. 1937 : **8** : 96–105.
A test for deviation from the single factor ratio, allowing the combination of F_2 and back-cross data is given, with a test for heterogeneity of the two sets of data. The method is illustrated by application to a case of a good 3 : 1 ratio and to a case in which the ratio was disturbed by linkage with a lethal factor, this case being analysed in some detail.
The relative values of F_2 and back-cross families in testing for deviations from single factor expectations are discussed and it is shewn that when the proportion of recessive gametes given by the F_1 is $\frac{1}{2}$, which is the normal case, three plants of an F_2 yield as much information as four plants of the back-cross.

308. SMITH, H. F. 575.114:519.24
The test of significance for Mendelian ratios when classification is uncertain.
Ann. Eugen., Camb. 1937 : **8** : 94–95.
A method is illustrated whereby, when classification is uncertain in a segregation into two classes, an estimate of the amount of misclassification can be obtained from the F_2 data and the data from such F_3 families as it is possible to raise. The agreement of the observations with the hypothesis can then be examined by testing for heterogeneity at two points: (1) among the F_2 families and (2) between the F_2 and F_3 estimates of misclassification. The example given is the inheritance of "firing" in wheat.

309. CATCHESIDE, D. G. 575.243:576.356.2:537.531
Biological effects of irradiation.
Sci. J.R. Coll. Sci. 1936 : **6** : 71–76.
A concise, general account of the induction of gene mutations and structural changes in chromosomes by X-ray irradiation.

310. CALDER, R. A. 575.3:633
Environment in relation to crop improvement.
Proc. 5th Conf. N.Z. Grassland Ass. (1936) : 1937 : 205–10.
Having regard to the importance in a variety of adaptation to the environment, the author suggests that selections bred at a central station should be tested at branch stations situated in localities representative of the main agricultural areas. He gives suitable places for such branch stations in New Zealand.

EVOLUTION 576.12

311. POULTON, E. B. 576.12
The history of evolutionary thought as recorded in meetings of the British Association.
Nature, Lond. 1937 : **140** : 395–407.
In this presidential address to the British Association, 1937, the history of evolutionary theory is illustrated by reminiscences of former meetings of the Association.

CYTOLOGY 576.3

312. TISCHLER, G. 576.312.35:581.5:582
On some problems of cytotaxonomy and cytoecology.
J. Indian Bot. Soc. 1937 : **16** : 165–69.
Genera can be classified from the cytological point of view into four different categories:—
(1) Chromosome number the same in all species (e.g. *Pinus*).
(2) Multiple or polyploid series (e.g. *Chrysanthemum*).
(3) Chromosome numbers different but not polyploid (e.g. *Carex*).
(4) Chromosome number shews only small variations (e.g. *Antirrhinum*).
Attention is drawn to the fact that changes in chromosome number seem effective in producing new ecotypes, and evidence is brought forward to shew that polyploids are adapted to more rigorous climatic conditions than nearly related diploids. J. G. H.

313. MATHER, K. 576.312.36:537.531
The experimental determination of the time of chromosome doubling.
Proc. Roy. Soc. Lond. 1937 : **124** : Ser. B : No. 834 : 97–106.
By determining the percentage of broken chromatids and broken chromosomes after subjecting the flower buds to X-radiation at different periods in the pollen tetrad formation of *Tradescantia, Eremurus* and *Allium*, the author shews that chromosome splitting takes place during the resting phase between meiosis and mitosis. J. G. H.

314. 63.00.15(54)
BURNS, W. 575:633(54)
The Imperial Agricultural Research Institute, New Delhi.
Nature, Lond. 1937 : **139** : 431–32.
A brief account of the Institute, recently transferred from Pusa to New Delhi. The plant breeding work is to be maintained and intensified and cytological and plant physiological work is to be developed.

FIELD TESTS 631.421

315. CROWTHER, E. M. 631.421
The technique of modern field experiments.
J.R. Agric. Soc. 1936 : **97** : 54–81.
A survey of the development of field experimentation from the middle of the last century to the present day.

316. 631.421
WELCH, B. L. 519.24
On the z-test in randomized Blocks and Latin Squares.
Biometrika 1937 : **29** : Pts. I & II : 21–52.
For Randomized Blocks and Latin square experiments an investigation has been made into the distribution of the statistic "z", generated by the application to the observed plot yields of the whole fundamental set of arrangements, of which the actual field arrangement is one chosen at random. A "null" hypothesis is assumed that treatments have no differential effect on the plots. Comparison with results from normal theory shewed exact agreement in the means, but disagreement in the variances. Consideration of some uniformity trial data shewed close enough agreement between randomization and normal theory variances of U (a function of z) in the case of randomized blocks, but with the Latin square the randomization variance of U was considerably smaller than that of the normal theory. The bearing of this result on the question of possible bias in the usual z-test is discussed by the author.
J. W.

317. YATES, F. 631.421
A further note on the arrangement of variety trials: quasi-Latin squares.
Ann. Eugen., Camb. 1937 : **7** : 319–32.
The principles of quasi-factorial design, already laid down by the author, are extended so as to enable trials involving a number of varieties or treatments which is a perfect square (with certain exceptions) to be so arranged that differences associated with two groupings of the experimental materials, such as the rows and columns of an agricultural field trial, are simultaneously eliminated from the varietal comparisons. A numerical example is provided by superimposing a quasi-Latin square design for 25 varieties on a uniformity trial of orange trees. Various other possible applications of the quasi-Latin square principle are discussed.
J. W.

318. COMRIE, L. J., HEY, G. B. and
HUDSON, H. G. 631.421:519.2
The application of Hollerith equipment to an agricultural investigation.
Suppl. J. Roy. Statist. Soc. 1937 : **4** : 210–24.
An extensive experimental investigation on the errors of plot lay-outs, or on the different methods that might be adopted for sampling the material, necessitates a very large amount of computing work on uniformity trial data. This paper describes the way in which Hollerith machines may be adapted for doing much of the laborious arithmetic work, including the calculation of analyses of variance and covariance. J. W.

319. KADAM, B. S. and
PATEL, S. M. 631.421:633.171
Studies in field-plot technique with *P. typhoideum* Rich.
Emp. J. Exp. Agric. 1937 : **5** : 219–30.
Details are given of the results of calculating the experimental errors for various sizes and shapes of plots, constructed from uniformity trial data with bajari, *Pennisetum typhoideum* Rich., in the seasons 1933 and 1934. Standard errors, expressed in percentages of the mean, diminished with increase of plot size where elimination of fertility differences was brought about by well-arranged blocks, but the trend was in the reverse direction with poorly and badly arranged blocks. Smaller plots gave in general more information per unit area than larger ones, but there was one very efficient arrangement with a plot of size 264 x 16½ feet, which gave a standard error of 4·8 per cent in 1933. For field experiments ½-guntha plots are considered more suitable than ¼-guntha plots. J. W.

PLANT DISEASES 632

320. 632.97
A summary of legislation relating to the introduction of plants into the Colonial dependencies of the British Empire as at the end of December, 1936.
Printed and published by H.M. Stationery Office, London 1937 : Colonial No. 141 : Pp. 65.
Under each colony is given the reference to the legislation, general remarks, a list of articles of which the importation is completely prohibited, with the countries from which importation is prohibited; and finally a list of articles of which the importation is conditionally prohibited, with the conditions under which importation may be allowed.

CEREALS 633.1

321. 633.1:575(56.9)
633.15–1.521.1
Seed selection.
Agric. Suppl. No. 22 to Palest. Gaz. No. 752 of 21st October, 1937 : 173–77.
It is suggested that cultivators should practice selection for seed in their own crops and instructions are given, in some detail in the case of maize.
The selection of strains of wheat and barley is being carried on at the main agricultural station at Acre, attention being directed to yield, earliness and resistance to diseases and hot east winds. The material used is principally local varieties, though imported varieties are also employed. Hybridization has not yet been attempted.

WHEAT 633.11

322. 633.11:575(71)
58:007
Late Sir Charles Saunders.
J. Aust. Inst. Agric. Sci. 1937 : **3** : 172–73.
An obituary note, briefly describing the breeding of Marquis wheat.

323. 633.11:576.356.52:581.036.1
RAW, A. R. 633.16:576.356.52
Genetical studies with wheat—haploids of *Triticum vulgare*.
J. Dep. Agric. Vict. 1937 : **35** : 300–06.
Occasional aberrant, sterile plants are found in cultures of *T. vulgare* at Werribee, Victoria. In 1936, nine such plants were examined cytologically and were found to be haploids. They differ outwardly from normal plants by a general reduction in size, excessive late vegetative vigour, reddish purple pigmentation of the foliage and glumes and almost complete sterility. At the first division of meiosis from 0 to 5 bivalents are formed and an occasional trivalent. The chromosomes are distributed at random to the poles at anaphase and divide more or less normally at the second division. The pollen is very irregular.

The production of these haploids, which occur with a frequency of about 0·0001 per cent, is attributed to excessively high temperature during the flowering period of the parent wheat plant.
A suspected haploid was observed in the *Hordeum vulgare* cultures in 1935.

324. PETERSON, R. F. 633.11–2.452–1.521.6:575
Problems in the development of rust resistant varieties of wheat.
Rep. Canad. Seed Gr. Ass. 1936–37 : 52–58.
A general account of the breeding of stem rust-resistant wheat by hybridization followed by pedigree selection, the cross Marquis x Hope being taken in illustration.

325. 633.11–2.452–1.521.6:575(94.4)
The toll of wheat stem rust.
Agric. Gaz. N.S.W. 1937 : **48** : p. 502.
It is mentioned that rust-resistant wheats are being bred from crosses between Kenya wheats and Florence and Dundee.

OATS 633.13

326. DERICK, R. A. 633.13(71)
Standard descriptions of registered oat varieties.
Publ. Dep. Agric. Can. 1937 : No. 553 : Pp. 31.
Descriptions, with photographic illustrations, of eleven varieties.

327. DERICK, R. A. and
LOVE, R. M. 633.13:575.243:537.531:576.356.2
Artificially induced fatuoids in a dwarf mutant oat.
Sci. Agric. 1937 : **17** : 703–06.
In the progeny of X-rayed seedlings of a dwarf mutant type of oats known as Trelle's Dwarf, there appeared about 3 per cent of dwarfs with the characteristics of homozygous fatuoids. No other types of mutation were observed.
Cytological studies of the first meiotic division shewed the frequent appearance of an association of four chromosomes in the dwarf and of two such associations in the dwarf fatuoid, suggesting that translocations have occurred.

MAIZE 633.15

328. BRIEGER, F. G. 633.15:581.483:575.17
Genetic control of aleurone and endosperm colour in maize.
Proc. Linn. Soc. Lond. 1936 : **148** : 95–96.
A brief note on the use of endosperm and aleurone factors in maize in the study of dominance and gene interaction.

BARLEY 633.16

329. BOSE, R. D., AZIZ, M. A. and 633.16–2.183:575.11:581.44
BHATNAGAR, M. P. 633.16:575.127.2:575.11:581.46
Studies in Indian barleys IV. The inheritance of some anatomical characters responsible for lodging and of some earhead characters in an interspecific cross between two Pusa barleys.
Indian J. Agric. Sci. 1937 : **7** : 48–88.
Pusa Type 1, a weak-strawed barley, differs from Pusa Type 21, a strong-strawed variety, in the arrangement and development of the mechanical tissue of the culms. In the former the sclerenchyma is very close to the periphery and poorly developed while in the latter it is very well developed and away from the periphery to which it is connected by sub-epidermal "girders". A cross between these two barleys was studied genetically, and four phenotypes were distinguished in F_2 according to the arrangement and position of the sclerenchyma, viz. two phenotypes like the parental types, and two which were intermediate between them. It is concluded that at least two genetic factors are concerned. *A* is a dominant factor

which conditions the weak development of sclerenchyma characteristic of the lodging variety; *B* is a supplementary factor similar to *A* but less potent in effect. The recessive allelomorphs *a* and *b* condition resistance to lodging.
The radial width of the sclerenchymatous band, the diameter of the tangential axis of the vascular bundles and the diameter of the radial axis of the vascular bundles shewed a definite association with the four anatomical phenotypes studied. No correlation was found to exist, however, between the latter and fertility of the ear, width of outer glumes, length of ear, tillering and maturity.
In the second part of the paper the results of inheritance studies on the fertility of the lateral florets, awn development and the nature of the outer glume are given. Single factors were found to determine the inheritance of all these characters and simple segregations were obtained in the F_2. There was complete linkage between two-rowed fertility and the lack of development of awns on the lateral floret, between intermediate fertility and the development of pointed or tipped awns on the lateral florets, and between six-rowed fertility and the development of full awns on the lateral florets; the inheritance of fertility of the lateral florets and the development of the awns may therefore be controlled by the same factor pair.
Linkages between certain characters are also reported. B. P. P.

RICE 633.18

330. Mitra, S. K. and Ganguli, P. M. 633.18:575.11.061.6:581.46
Inheritance of inner glume colour in rice.
Indian J. Agric. Sci. 1937 : **7** : 126–33.

The factors *C* and *L* are respectively responsible for the production of blackish green and light brown colours in the floral stage. When both are present the colour is green and when both are absent the colour is brown. In crosses between green and brown-glumed strains, ratios of 9 green : 3 blackish green : 3 light brown : 1 brown were obtained in F_2.
In a cross between a strain with green glumes and another with blackish green glumes a ratio of 3 green : 1 blackish green was obtained in F_3. When the mature glume colours were studied, however, an entirely different ratio of 36 black : 21 yellow : 7 blackish brown was obtained. This is explained on the assumption that there are two factors B_1 and B_2 for black colour and one factor *Y* for yellow.
In another cross between strains possessing black and blackish brown mature inner glume colours, respectively, a ratio of 3 black : 1 blackish brown was obtained in F_3. B. P. P.

331. Kadam, B. S. 633.18:575.113.4–181.13
Genes for dwarfing in rice.
Nature, Lond. 1937 : **139** : p. 1070.

By crossing different dwarf forms of rice the author has found that there are five different genes for dwarfness. One of these, d_2, occurs in seven varieties, the others only in one each.

332. Kadam, B. S., Patil, G. G. and Patankar, V. K. 633.18:575.125:631.557
Heterosis in rice.
Indian J. Agric. Sci. 1937 : **7** : 118–25.

Five crosses were studied in respect of height of plant, number of culms per plant, length of panicle, yield, and weight of the whole plant. No evidence of heterosis was obtained except in respect of yield. In two crosses the average yield of the F_1s was significantly better than that of the higher-yielding parents. B. P. P.

333. Haigh, J. C. 633.18:575.148:575.42"793"
The effect of selection on the age of pure-line paddy.
Trop. Agriculturist 1937 : **89** : 71–74.

Selection for three generations in an inbred variety of rice did not alter the earliness of flowering or ripening.

334. Sethi, R. L., Sethi, B. L. and Mehta, T. R. 633.18–2.7–1.521.6:575.11:581.46
Inheritance of sheathed ear in rice.
Indian J. Agric. Sci. 1937 : **7** : 134–48.

In the United Provinces severe damage is done to the rice crop by the rice fly, *Leptocorisa varicornis*, and the only varieties which are resistant belong to the coarse-grained, poor-yielding and early-ripening "Sathia" group. In these varieties the panicle remains within the leaf-sheath and thus escapes the ravages of the rice fly. With the object of transferring this resistance of the "Sathi" varieties to economically desirable varieties crosses were made between them. The present paper describes the mode of inheritance of the sheathed panicle which determines resistance to the attack of the rice fly.

The emerged condition was found to be dominant in F_1 and in F_2 four phenotypes were distinguished, namely, emerged, partially emerged, tip-emerged and enclosed. For convenience the first two classes were amalgamated; the resulting three classes were in the ratio of 49 : 3 : 12 and the results are explained on a trihybrid hypothesis. B. P. P.

ROOTS AND TUBERS 633.4

335. Richharia, R. H. 633.42:575.127.5:635.15
Investigation on F_1 and F_2 hybrids between *Brassica carinata* and *Raphanus sativus*.
J. Indian Bot. Soc. 1937 : **16** : 137–44.

Although the meiotic pairing of chromosomes during pollen formation is almost completely regular in the two parents, the F_1 hybrid shews up to nine bivalents with a corresponding number of univalents. The behaviour of the latter is extremely irregular. Various ways of restitution nucleus formation are described. The F_2 hybrid shews various proportions of uni- and bivalents with an occasional tri- or tetravalent. Dyads, triads and tetrads of pollen grains are produced in the proportion of 18, 6 and 76 per cent respectively. The hybrids in both generations are extremely sterile. J. G. H.

336. 633.491:575
Salaman, R. N. 633.491–2.411.4–1.521.6(42)
Potato variety production: a new departure.
Gdnrs' Chron. 1937 : **102** : 326–27.

The author shews how the intensive breeding of potatoes from a small number of original stocks has led to an impoverishment of the stock of genes and enumerates physical characters of the tuber and haulm and physiological characters which have been or are in process of being lost.

This is being remedied by recourse to material from the original home of the potato and the author's work on breeding for blight resistance is cited in example. It is suggested that his resistant stocks, carrying good economic characters, might be distributed to the commercial potato breeders for use as foundation stocks.

FIBRES 633.5

337. 633.51:575(54.8)
Sampson, H. C. 633.51:575.127.2
Some reminiscences of work on the cotton crop.
Emp. Cott. Gr. Rev. 1937 : **14** : 294–300.

The author gives an account of his early breeding work in Madras and incidentally mentions a natural hybrid between Cambodia (*G. hirsutum*) and Karunganni (*G. arboreum* var. *neglectum*).

338 633.51:575(96.1)
Dass, C. M. 633.51 No. 172
Fiji hybrid cotton. No. 172.
Agric. J. Fiji 1937 : **8** : 18–19.

An account of the breeding of the cotton variety No. 172. The object of the work was to produce a variety with the robust habit of Kidney (*Gossypium peruvianum*) and yielding lint capable of competing in England with super-fine Egyptian cotton.

The initial material consisted of some natural hybrids of Kidney and Sea Island, sent from New Guinea in 1926. During the selection a back-cross to Sea Island was performed to improve the lint qualities and it was from the progeny of this back-cross that No. 172 arose. Further selection is being carried on in No. 172 to improve the lint characters and it has also been back-crossed again to Sea Island.

339. Amin, K. C. 633.51:575.127.2(54.7)

Interspecific hybridization in cotton.

Poona Agric. Coll. Mag. 1937 : **29** : 50–52.

Another 10 American-Asiatic hybrids have been raised. Using *G. hirsutum* as pollen parent 20 back-cross hybrids have been obtained, while by pollinating American cotton with hybrid pollen one back-cross hybrid was produced and has given rise to 12 plants in the next generation.

The F_1 hybrids are being maintained as rattoons and it has been found possible to propagate them by cuttings.

Attempts to produce callus formation with a view to inducing chromosome doubling have been without success.

340. 633.51:575.127.2:575.11

Harland, S. C. 633.51:575.129

Homologous loci in wild and cultivated American cottons.

Nature, Lond. 1937 : **140** : 467–68.

The triploid hybrids between *Gossypium barbadense* (n = 26) and the wild American species *G. aridum*, *G. Amourianum* and *G. trilobum* (n = 13) were found to be weakly fertile on the male side. By making two successive back-crosses of the hybrids with *barbadense* or *hirsutum* fertility was completely restored and the following transferences of genes from the wild to the cultivated species were effected: normal (C^r) from *aridum*, *Armourianum* and *trilobum* to *barbadense* crinkled (c^r); (S^B) Petal Spot from *aridum* to *barbadense* and *hirsutum* and (S^{AB}) Petal Spot from *Armourianum* to *barbadense*. The existence in the wild species of allelomorphs of factors in the cultivated species is thus demonstrated and supports the theory that the cultivated cottons of the New World are amphidiploid in origin and that 13-chromosome species from both Asia and America have played a part in their formation.

The normal allelomorphs of crinkled carried by *aridum* and *trilobum* appear to be of a lower dominance potency than that of *barbadense*. The *aridum* and *Armourianum* genes for petal spot also appear to be different from those of either *barbadense* or *hirsutum*.

341. Hutchinson, J. B. and
Ghose, R. L. M. 633.51:576.16:582

The classification of the cottons of Asia and Africa.

Indian J. Agric. Sci. 1937 : **7** : 233–57.

The cultivated Asiatic cottons are classified into *G. arboreum* L. (vars. *typicum*, *neglectum* and *cernuum*) and *G. herbaceum* L. (vars. *typicum*, *frutescens* and *africanum*). *G. arboreum* var. *typicum* and *G. arboreum* var. *neglectum* are divided into four forms, *bengalensis*, *burmanica*, *indica* and *soudanensis*, on geographical grounds and on the basis of their recent evolutionary history. The cultivated New World cottons are classified according to Harland's scheme into *G. hirsutum* L., *G. religiosum* L. and *G. barbadense* L.

The wild cottons, *G. Stocksii* Mast. and *G. anomalum* Wawra and Peyr., are described and the parallelism between them and *G. herbaceum* and *G. arboreum* discussed. Reference is also made to *G. Bakeri* Watt and *Cienfugosia triphylla* Engler.

The paper is a comprehensive one and discusses, *inter alia*, the distribution of the Asiatic species, the present status of the New World species in India and Africa. B. P. P.

342. Hutchinson, J. B., Ghose, R. L. M. and Ramanatha Ayyar. 633.51:581.466:575.11
Petalody in cotton.
Curr. Sci. 1937 : **6** : 99–100.
A type of petalody previously reported to be a simple recessive (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 881) has been found by Hutchinson and Ghose to be incompletely recessive, the heterozygotes having a quarter to half their stamens slightly petaloid. Ramanatha Ayyar, one of the original authors, confirms this.

343. Afzal, M. 633.51:581.49
A note on the hairiness of cotton.
Indian J. Agric. Sci. 1936 : **6** : 823–27.
While American cottons were glabrous in the hypocotyledonary regions, desi cotton was hairy in that region. Both American and desi cottons had glabrous cotyledons.
In the adult plant it was found that the hairiness of the leaf increased from the lower part of the plant to the top and it is pointed out that in genetic studies on this character it is important to fix the position and age of the leaf used for hair-counting in a hybrid population.

344. Panse, V. G. and Patel, A. F. 633.51–2.484–1.521.6:581.43
A genetical study of roots in relation to disease resistance in cotton.
Indian J. Agric. Sci. 1937 : **7** : 451–57.
The object of the study was to discover if any genetical relationship existed between root characters of Gujarat cotton types and resistance to root-rot disease caused by *Macrophomina* sp. The root-systems of both resistant and susceptible varieties were examined and it is concluded that a long tap-root, profuse branching below 15 cm. and few laterals in the first 15 cm. of the soil are associated with resistance to root-rot. It is further concluded that differences in certain root characters between resistant and suceptible plants exist within a strain and are generally similar to those observed between resistant and susceptible varieties. The practical value of this finding to the plant breeder is pointed out. B. P. P.

345. Peirce, F. T. 633.51:677.1:578.081
What kind of cotton *do* they want ?
Emp. Cott. Gr. Rev. 1937 : **14** : 286–93.
In this discussion of the problem of evaluating samples of cotton the author defines a property called intrinsic fineness, an inverse measure of hair weight after correction for immaturity, and suggests that it is the most stable genetic character of lint.

346. Banerji, I. and Samal, K. K. 633.524.1:576.354.4
Microsporogenesis in *Crotalaria juncea* Linn.
Indian J. Agric. Sci. 1936 : **6** : 116–26.
Meiosis in the pollen mother cells of *C. juncea* is described in detail The haploid number is 8 and the only irregularities noted are the precession of one pair of chromosomes at first anaphase and occasional lagging of others at the same stage.

347. Lock, G. W. 633.526.1:575(67.8)
The Sisal Experimental Station.
Report for the year 1936. Pamphl. Dep. Agric. Tanganyika 1937 : No. 16 : Pp. 11.
The collection of *Agave* species maintained for breeding work includes *A. sisalana*, *A. nirvana*, *A. miradorensis*, *A. fourcroydes*, *A. rigida*, *A. fortunae* and *A. zapupe*. Bulbils taken from a parent plant of *A. sisalana* which produced an exceptionally large number of leaves on a tall trunk were planted in the nursery to see whether the progeny retain these characteristics of the parent.
Over 3,000 hybrids and seedlings raised at Amani are being grown, representing *A. amaniensis* x *A. angustifolia* and reciprocal, *A. amaniensis* selfed, *A. fortunae* open-pollinated and also a few plants of seedling A.40.
A variety trial is included in the different trials laid out.

348. Allan, H. H. and Zotov, V. D. 633.526.41:575.127.2
An artificial cross between *Phormium Colensoi* and *P. tenax*.
N.Z. J. Sci. Tech. 1937 : **18** : 799–804.
A description is given of an F_1 hybrid from the cross *P. Colensoi* Hook. x *P. tenax* J.R. et G. Forst. The plant is intermediate in size and appearance, but approaches the male parent. It yielded abundant seed. Four hybrids were obtained altogether from the cross, but one did not survive transplanting and two were badly damaged in a storm.

SUGAR PLANTS 633.6

349. 633.61(95)
Bell, A. F. 633.61–2.8–1.521.6
Sugar cane in New Guinea.
Cane Gr. Quart. Bull. 1937 : **5** : 64–66.
A brief account of the native cultivation in the mountainous "uncontrolled" region of New Guinea. It is pointed out that this region should be a valuable source of new varieties and in particular that resistance to Fiji disease might be found there.

350. 633.61:575(54)
Sugar cane agriculture in India. Recent progress in research.
Agric. Live-Stk. India 1937 : **7** : 445–48.
The article includes a brief description of the Indian work on sugar-cane breeding, mentioning the use of wild native forms and the induction of mutations by X-rays and bud mutilations.

351. 633.61:575(69.82)
Seventh Annual Report of the Sugar Cane Research Station, for the year 1936.
Dep. Agric. Colony of Mauritius 1937 : Pp. 45.
A list of the crosses made in 1936 is given. These were based on an analysis of the parents used during the past six years, resulting in the elimination of many unproductive crosses. The 202 crosses included 29 crosses between noble canes, 172 crosses involving other species and 1 intergeneric with sorgho; there were also 6 selfings.
The results of the first, second and third-trial seedlings are briefly described. Outstanding among the third trial seedlings were M.65/31, M.127/32, M. 130 32 and M.134 32, all fourth nobilized glagah types. In addition to data on yield and disease resistance, information was obtained from the third trials on defecation quality of juice, percentage of internodes attacked by cane borers and percentage of fibre in cane. Certain seedlings of P.O.J.2878 gave, as expected, indications of defecation trouble like the parent cane. In the field trials, apart from the Mauritius seedlings M.108/30, M.171/30 and M.73/31, the most successful varieties were B.H.10(12), P.O.J.2727, P.O.J.2878 and Selangor Seedling. B.H.10(12) is becoming increasingly popular in the island.
The varieties M.171/30, M.72/31 and M.73/31 were released for general distribution during 1936. M.171/30 outyielded its controls in field trials by an average of 26 per cent. Its parents are R.P.6 and M.27/16.
M.108/30, released in 1935 for *Phytalus*-infested areas has lived up to its early promise. The cross P.O.J. 2828 x Uba Marot gives clones suitable for *Phytalus* lands, but with an unfortunate tendency to arrow. Two desirable non-arrowing clones, M.167/32 and M.168/32, have now been obtained from this cross and from their yields under *Phytalus* conditions appear likely to help in solving the variety problem in *Phytalus*-infested areas.
In appendices are given a summary of the cane breeding work in 1930-36, performance of selected seedlings and results of variety trials cut in 1936.
The root investigations are described (Cf. Abst. 360).
Experiments on the acceleration of arrowing by injecting a variety of chemicals into the cane gave no positive result, though nitrogen, introduced as urea, caused a delay in arrowing. The effect of vernalizing cuttings is being tried and so far has been found to cause an initial set-back in growth and a slight increase in tillering. The effect on arrowing has not yet been observed.

352. 633.61:575(72.98)

Third Annual Report of the British West Indies Central Sugar Cane Breeding Station ending September 30th, 1936.

B.W.I. Cent. Sug. Cane Breed. Sta. 1936 : Pp. 18.

The breeding work is following the lines already laid down (Cf. "Plant Breeding Abstracts", Vol. VI, Absts. 368, 726; Vol. VII, Abst. 435).

The floral characteristics ("sex") of five varieties are reported. B.3013 and 3124 were male-sterile, while B.693 and 268 and Badila were strong males.

In all 85 crosses were made, divided into crosses between noble varieties, nobilizations of *Saccharum Barberi*, of *S. spontaneum* and of *S. sinense* and crosses involving several species of *Saccharum*. Over 16,000 seedlings were potted, of which nearly 15,000 were planted in the field nursery to form the B.38′ series.

Of the B.37′ series 7,422 seedlings out of 12,233 in the field nursery were planted in the first year seedling test, an elimination of 40 per cent. Accounts are also given of the B.35′, 34′ and 33′ series of seedlings. The select seedling and variety trials, in which the B.32′, 31′ and 30′ series participated, are carried out at stations representative of four ecological types of land, based on soil type and rainfall. The results of the trials are given in diagrammatic form.

The canes of which seed pieces have been sent to the Plant Quarantine Station, Trinidad, are listed and also the crosses of which fuzz has been sent to Trinidad for raising seedlings to be tested for froghopper resistance; these are mainly crosses involving nobilized canes.

The growth measurements and root development investigations have been continued.

Gumming disease investigations have shewn that absence of leaf infection is a reliable indication of resistance. The routine tests of gumming disease resistance carried out under conditions of natural infection in the field in the multiplication plots of the first year seedlings, are now based on leaf infection. In the studies on the inheritance of resistance, it has been noted that very few nobilized seedlings shew appreciable susceptibility.

Further experiments on fuzz storage indicated that germination was improved if the fuzz was stored at low temperatures (32° F.), that different crosses varied considerably in germination after storage and that fuzz from crosses involving wild species directly or indirectly shewed less loss in viability, though the fuzz of noble varieties has the higher immediate germination. Experiments on fuzz storage are to be discontinued, owing to the success of the field nursery, to which fuzz storage was an alternative.

353. 633.61:575(72.98)
633.61 B.726
McIntosh, A. E. S. 633.61 B.2935

A botanical and agricultural description of recently produced commercial seedlings.

Bull. B.W.I. Cent. Sug. Cane Breed. Sta. 1937 : No. 14 : Pp. 9.

Descriptions are given of the seedlings B.726 and B.2935, bred and cultivated in Barbados. B.726 is a seedling of Ba.11569, male parent unknown; though yielding abundant, fertile pollen, it is of little value as a parent in breeding work. B.2935 is derived from the cross Ba.11569 x Ba.6032 and is used as a male parent in breeding work, especially in nobilizing wild canes.

354. G . . . . . , H. C. P. 633.61:575(92.2)

The Proefstation Oost Java at Pasoeroean. Fifty years of achievement.

Int. Sug. J. 1937 : 39 : 338–39.

A brief account of the work of the East Java Experiment Station at Pasoeroean, on the occasion of its fiftieth anniversary. The breeding of the famous sereh-resistant varieties of sugar cane is mentioned.

355. 633.61:575(94.3)

Thirty-seventh Annual Report of the Bureau of Sugar Experiment Stations.

Brisbane, 1937 : Pp. 49.

The results of variety trials carried out at the three Experiment Stations, Meringa, Mackay and Bundaberg are given.

The crosses made during the year are listed. They are between noble canes or nobilized varieties. From the 1935 seedlings 271 selections have been made, and 71 from the 1934 seedlings, while 29 seedlings were included in yield selection trials from which seedlings to be given Q. numbers are selected. The seedling Q.2, which is of the thin type, was released for commercial planting during the year. Of the four seedlings set out in trials last year, Q.1, 4, 10 and 12, only Q.10 shews encouraging promise at the present time.

Family trials for resistance to gumming disease shewed that P.O.J.2725 confers high resistance on a very high proportion of its progeny, like P.O.J.2878, but P.O.J.2722 and 2940 were not nearly so striking in this respect.

Hot houses for raising seedlings are being provided at all three stations.

356. 633.61:575.12:578.08

Sexual reproduction in sugar cane.

S. Afr. Sug. J. 1937 : **21** : 459–61.

A brief account of the technique of crossing in sugar cane breeding work.

357. Venkatraman, T. S. 633.61:575.127.5:633.584.5

Sugar cane—bamboo hybrids.

Indian J. Agric. Sci. 1937 : **7** : 513–14.

Bambusa arundinacea was successfully crossed at Coimbatore with the sugar cane varieties, P.O.J.213 and P.O.J.2725, using the latter as the female parents, and twenty-nine hybrids were obtained. The hybrids, even in the very early stages, displayed characters not previously noticed in sugar cane seedlings. Later it was clear from the mode of underground branching, nature of shoot and bud formation, central cavity in the stem, anatomical characters of the stem and root and the number of chromosomes that there could be no doubt regarding the authenticity of the hybrids.

The F_1 seedlings shewed considerable variations among themselves and it is stated that the abnormalities encountered were even more numerous than those met with in the intergeneric cross between sugar cane and sorghum. B. P. P.

358. McIntosh, A. E. S. 633.61–1.531.16

Sugar cane fuzz storage experiments. I. (1934-35).

Bull B.W.I. Cent. Sug. Cane Breed. Sta. 1937 : No. 12 : 1–8.

McIntosh, A. E. S. and Stevenson, G. C.

Sugar cane fuzz storage experiments. II. (1935-36).

Bull. B.W.I. Cent. Sug. Cane Breed. Sta. 1937 : No. 12 : 9–16.

As a result of the two series of experiments it was found that the best treatment for retaining viability of the seed was storage at a temperature near freezing point in an atmosphere of carbon dioxide over calcium chloride. The optimum amount of calcium chloride per litre of storage space, was in the region of 20 grm. which was the maximum used.

The variability observed between crosses and between seasons would make the routine use of fuzz storage unreliable in breeding work in Barbados. The use of a field nursery appears to be a better method of bridging the gap between the harvesting of seed in November and December and planting in the first year seedling trial the following November and no further fuzz storage experiments will be carried out (Cf. also Abst. 352).

359. Rosenfeld, A. H. 633.61–2.111-1.521.6:575.127.2
Frost resistance in cane seedlings.
Int. Sug. J. 1937 : **39** : p. 337.
In this correction to the article by the same author, reviewed in "Plant Breeding Abstracts", Vol. VII, Abst. 1134, it is pointed out that the crosses Ba.11569 x B.3266 and B.3238 x B.391 are not strictly noble (*S. officinarum*) crosses as previously stated, but advanced nobilizations of Java glagah (*S. spontaneum*).
Also, *S. robustum* was stated to have been described by Dr. Jeswiet, but actually he has not yet published the description of this species.

360. Evans, H. 633.61–2.112–1.521.6:581.43
A preliminary study of root characters as affecting drought resistance in two sugar cane varieties and in their seedlings.
Bull. Sugar Cane Res. Sta. Dep. Agric. Mauritius 1937 : No. 14 : Pp. 20.
The varieties used were P.O.J.2364 and D.109. The seedlings were obtained from the cross P.O.J.2364 x D.109, the original seedling stools being used. The direct examination method shewed that at the age at which they were studied, 11 months, the seedlings' roots resembled those of P.O.J.2364 more than those of the male parent. An estimation of the root hair surface confirmed this, P.O.J.2364 and the seedling examined having values of the same order, while D.109 had two or three times as much.
The reaction of the varieties P.O.J.2364, D.109, P.O.J.2878, B.H.10(12) and White Tanna to artificial drought, induced by cutting away their roots to a depth of one foot outside a radius of 6 inches from the centre of the stool, was found to agree with their behaviour under natural drought conditions. Resistance was positively correlated with the extent of the absorbing surface of the roots. The seedlings used in the present study could not be fitted into such a scheme, probably because different seedlings had to be used to determine reaction to artificial drought and absorbing surface. D.109 was more resistant to drought than P.O.J.2364, and the seedlings were more susceptible than either parent.

361. 633.63–1.557:581.192
Science in sugar production.
Aust. Sug. J. 1937 : **29** : 327–31.
In this article by O. W. Willcox, taken from the Sugar Reference Book, 1936, the author states that the yielding abilities of sugar beet varieties are inversely proportional to their percentage nitrogen content.

362. Banerji, I. 633.689:581.162.5:576.354.4
Sterility in *Colocasia antiquorum* Schott.
J. Indian Bot. Soc. 1937 : **16** : 159–64.
Sterility in *Colocasia antiquorum* is found to be due to irregularities in meiosis during both micro- and macrospore formation evinced at anaphase by non-disjunction and separation of bi- and univalents from the spindle into the surrounding cytoplasm. As a consequence the pollen grains are dimorphic and non-viable whilst the megaspores and ovules abort before maturation. J. G. H.

STIMULANTS 633.7

363. 633.71:575(69.82)
Report on the activities of the Government Tobacco Warehouse and the progress of Tobacco Manufacture in Mauritius for the six months ending 30th June 1936.
Colony of Mauritius 1937 : Pp. 31.
Contains the report of the tobacco breeding officer for the period mentioned. The results of the variety trials are briefly described. From these it is considered that Amarello 8.5.2. might be conditionally recommended to planters. Single plant selection is being performed and strains of Amarello are being tested for resistance to black shank. Included in these tests are also F_2 progenies from the crosses Florida Resistant x Amarello 8.5.2. and Constant x Amarello 8.5.2.

364. 633.72(54)

Annual Report. 1936. Agricultural Branch.
Indian Tea Ass., Calcutta 1937 : Pp. 73.

Annual Report. 1936. Mycological, Botanical and Bacteriological Branches.
Indian Tea Ass., Calcutta 1937 : Pp. 16.

Annual Report. 1936. Chemical Branch.
Indian Tea Ass., Calcutta 1937 : Pp. 11.

A complex experiment involving comparison of 12 jats as well as manurial and shade tree effects has been laid down by the Agricultural Branch. The results of other experiments, some of which involved comparisons of jats, are given in their report.
In the mycological report it is mentioned that an attempt was made to grow a large number of cuttings of selected Betjan tea plants, but that the cuttings were all killed by an attack of eelworm, distinct from that which attacks tea seedlings.
The Botanical Branch is studying the hairiness of the tea leaf, on the theory that there is some positive correlation between the degree of xeromorphy of the leaf and the quality of the tea. In another experiment, by manufacturing tea separately four times each from eight different bushes taken at random from one jat it was found that striking differences were present. Two of the bushes reached a good standard for strength, quality and yield.
The Chemical Branch has been investigating, *inter alia*, the effect of jat on tea quality and figures are given in respect of two light leaf Assam jats, a dark Manipuri and a China.

365. Tubbs, F. R. 633.72:575

The maintenance of capital.
Tea Quart. 1937 : **10** : 117–23.

Suggestions for improving the uniformity and yielding capacity of tea planting material are advanced. In the first place weakly and off-type seed bearers could be eliminated in the seed garden and poor type plants could be rejected by the planter. Secondly, uniform seed bearers could be produced by vegetative propagation; this would reduce but not eliminate variability. Finally, there is the possibility of using only vegetatively reproduced planting material, though completely suitable methods of vegetative reproduction have yet to be developed for tea.

366. 633.73:575(54.8)
633.73:581.483

Wilson Mayne, W. 633.73–1.421

Annual Report of the Coffee Scientific Officer, 1936-37.
Bull. Mysore Coffee Exp. Sta. 1937 : No. 16 : Pp. 15.

The study of the behaviour with regard to leaf disease (*Hemileia vastatrix*) of families derived from known parents has been continued but no features of special note have been found.
A study of the development of the coffee seed has given results at variance with those of Houk (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 265). The endosperm passes through a long rest period after fertilization while the nucellar tissues develop and form a "scaffolding" within which the true endosperm develops. The nucellar tissue is ultimately replaced by the endosperm and its remnants form the inner layer of the silver skin. The defect known as black bean is associated with abnormal activity of the nucellar tissues.
Individual yield records of the trees on a plot of about one acre have been collected with a view to studying the problem of plot size and the sources of variability in plot yields. Analysis of these figures, as yet incomplete, indicates that the greater part of the variability of yield is due to random causes and that field experiments with adult trees are unlikely to give satisfactory results, as the plot size and number of replications required to reduce the variability to manageable limits are so great. The solution appears to lie in reducing the variability of the planting material.

367. Burton, G. J. L. 633.73:575.42(67.62)
Coffee selection. How planters can help the coffee team.
Mon. Bull. Coffee Bd. Kenya 1937 : **3** : p. 155.
A further request to East African coffee planters to report to the Agricultural Department coffee trees outstanding in respect of yield or disease resistance, with a view to establishing clones. There has been little response to an earlier request (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 59).

368. 633.73–1.524.2(63)
A warning. *Harari* coffee.
Mon. Bull. Coffee Bd. Kenya 1937 : **3** : p. 160.
Harari coffee, imported from Abyssinia in 1930, continues to behave satisfactorily at the Scott Agricultural Laboratories in respect of vigour, resistance to drought and liquoring quality, but has given disappointing results in other districts. New plantings should therefore be made with care.
It has been found susceptible to coffee berry disease (*Colletotrichum coffeanum*), leaf disease (*Hemileia vastatrix*) and brown eye spot (*Cercospora coxeicola*).
Its drought resistance may make it a valuable rootstock.

369. Pound, J. F. 633.74–2.483–1.521.6(86)
Ecuador: its agriculture in 1937.
Proc. Agric. Soc. Trin. Tob. 1937 : **37** : 335–39.
The cocoa industry of the Western Coastal Plain of Ecuador is based on the Amacigales variety, there known as "Nacional". In 1890 seeds of Trinidad and Venezuelan cocoa were imported to Ecuador and among these the planters found trees which appeared to be resistant to witch-broom. The author obtained pods from many of the apparently resistant trees and hopes to grow the seedlings in the Trinidad testing nurseries to study their resistance.
Other wild and perhaps resistant types of cocoa exist in the forests of the Oriente region of Ecuador and these are to be studied during the next 12 months.

370. Salmon, E. S. 633.79:575(42.23)
Twentieth report on the trial of new varieties of hops.
E. Mall. Res. Sta., Kent 1937 : Pp. 15.
Notes are given on the parentage, yield and preservative quality of the new varieties bred at Wye and grown at East Malling. Eleven of the new varieties were higher in preservative value than the richest American hops.
The incidence of mosaic and downy mildew is given. The nine varieties attacked by downy mildew on the cone all have the American species *Humulus americanus* in their parentage.

OIL PLANTS 633.85

371. McGregor, W. G. 633.854.54:665.3:575.11
Inheritance of quality and quantity of oil in flax in relation to other plant characters.
Canad. J. Res. 1937 : **15** : Sect. C. : 362–79.
The correlations of oil content and drying quality with seed size, days to maturity, days from flowering to maturity and height of plant were determined from the data obtained from 21 varieties grown over a five year period at Ottawa. Refractometric methods were used for determining oil content and quality in addition to the ether extract method for oil content and the Wijs method for iodine number. The refractometric methods were found to be very useful for breeding studies.
Oil content and quality, flower and seed colour, seed size, oil colour and height of plant were studied in the crosses Cyprus x Ottawa 770B and Buda x Ottawa 770B. Iodine number (drying quality), seed size, oil content and height of plant were found to be each governed by several Mendelian factors. No association was found between these factors, although in the variety tests high oil content had been associated with large seeded varieties.

Colour of the petal, anther, filament, style, stigma and seed and the flatness or crimpiness of the petal are governed by the same single factor, the white, crimped petals and yellow seed of Ottawa 770 B being recessive to the blue petals and brown seed of the other two varieties. High iodine number was associated with the factor for yellow seed in both crosses. Oil colour, which is also of some economic importance, was apparently determined by several factors and was independent of seed colour.

372. LEPLAE, E. 633.855.34:575(67.5)

Recent improvement of African oil palms and palm oil production in the Belgian Congo.

Bull. Imp. Inst. Lond. 1937 : **35** : 174–80.

An account of oil palm selection in the Belgian Congo.

The Yangambi station, established in 1927 has developed a variety of the Tenera palm known as the Yangambi type which differs from other Tenera palms by a larger kernel, thicker shell, greater quantity of pulp and an ovoid shape.

Selection is based on individual tree records. More importance is attached to number of bunches than to weight of bunches and trees with a small number of heavy bunches are eliminated.

RUBBER PLANTS 633.91

373. 633.912:061.6(91)

The Rubber Research Institute of Malaya.

Kuala Lumpur, August 1937. Pp. 20.

A brief account of the Institute and its work, illustrated with photographs.

374. 633.912:575(54.8)

Report of the work of the Rubber Research Board in 1936.

Rubb. Res. Scheme (Ceylon) 1937 : (March) : Pp. 87.

No further progress in the selection and breeding of *Hevea* is reported except that clones have been established from most of the individual Prang Besar open-pollinated clonal seedlings planted at Nivitigalakele.

Test tappings of Ceylon and imported clones have been continued.

375. 633.912:575(91)

Annual Report 1936.

Rep. Rubb. Res. Inst. Malaya 1937 : Pp. 158.

The study of budded trees of the principal *Hevea* clones has been continued, marked differences in yield and vigour of growth being noted, as well as in respect of secondary characters. Observations on estates indicate that soil conditions may have a considerable influence on the development of different clones, though some clones are more widely adaptable than others. The relationship between stock and scion is being studied. There have been no additions to the collection of new clones established from high-yielding trees selected on estates and the further selection of promising parent trees is proceeding with the study of seedling families derived from proved clones.

No new crosses were made during the year, but a selection of parents was made in preparation for hand pollination work in 1937. The outstanding merits of A.44 and B.84 as parents in their ability to transmit high yield were again evident from the tapping of the 1928 and 1931 series of hybrid seedlings. The secondary characters of A.44 are less satisfactory. Individual trees in the different seedling families gave exceptionally high yields. A tree from the cross B.84 x A.44 (A.28 series) gave 26 lbs. dry rubber in a period of seven months and then went "dry", repeating the behaviour of the previous year. Buddings from this tree gave 13·2 lbs. per tree during the first tapping year at the age of five to six years. In general it has been found that when clones are established from hybrid seedlings, the highest-yielding clones are obtained from the highest-yielding individuals in the best families.

The seedlings obtained by open pollination of high-yielding clones gave lower yields than those from hand pollination, but were nevertheless very satisfactory; the variation in yield is greater in the open-pollinated families.
The seedlings from an isolated seed garden averaged 9 lbs. of dry rubber per tree at $7\frac{1}{4}$ to $8\frac{1}{4}$ years and shewed a great variation from family to family.
High positive correlations were found between yields of test tappings of seedling trees at an early age ($3\frac{1}{4}$ years onwards) and the yields of regular tappings beginning when the trees are $6\frac{1}{4}$ years old. The earliest tests therefore give a good indication of the future yield of the tree. The majority of the lowest yielding class of seedlings can be eliminated at the age of one year by a pricking test in which they are graded by latex flow.
The chemical division found indications that different clones give rubber of different quality; the data were unfortunately destroyed in the disastrous fire of September, 1936.

FRUIT TREES 634

376. 634.00.14(42)

Commercial fruit trials at Wisley, 1936.

J.R. Hort. Soc. 1937 : **62** : 296–303.

Accounts are given of the performance of new varieties of apples, plums, strawberries, raspberries, black currants, gooseberries, red currants and blackberries. Some Russian varieties of apples, cherries, pears and plums have been received.

377. Potter, J. M. S. 634.11:575(42)

Some new apples.

J.R. Hort. Soc. 1937 : **62** : 497–500.

The characteristics of the following varieties are described: Epicure (parents, Wealthy and Cox's Orange Pippin), Exquisite (parents, Cellini and Cox's Orange Pippin), Woolbrook Pippin (parents, Cox's Orange Pippin and an unknown variety) and Woolbrook Russet (parents, Bramley's Seedling and King's Acre Pippin).

378. Tydeman, H. M. 634.11–1.541.11:575

Studies on new varieties of apple rootstocks.

J. Pomol. 1937 : **15** : 165–90.

A study of trees worked on nineteen selected rootstocks from the cross Malling No. VIII (French Paradise) x Malling No. IX (Jaune de Metz), the scion variety being Lane's Prince Albert.
The rootstocks could be divided into five "vigour" groups. Those in two of these classes were more dwarfing than Malling No. IX, while others exerted a more vigorous effect than Malling No. VIII.
There was a close relation between the vigour of the trees and the size of the swelling at the union. There was also a correlation between the dwarfing character of the stock and the productivity of the tree, the trees on vigorous stocks being in every case the less productive in their early years.

379. Dickson, G. H. 634.22:581.162.32:575.127.2

Pollination of the Shiro plum.

Sci. Agric. 1937 : **17** : 727–29.

Shiro, a hybrid plum with the characteristics of a Japanese plum (*Prunus salicina*) is a satisfactory pollinator of the Japanese plum Burbank and sets fruit when hand pollinated with Burbank pollen. In the orchard, however, Burbank is not a satisfactory pollinator of Shiro. Certain *P. domestica* varieties such as Reine Claude and Lombard are satisfactory orchard pollinators of Shiro, but the seeds obtained by hand pollination of Shiro with these varieties are of low viability as compared with those produced by hand pollination with Burbank.

380. Bowman, F. T. 634.23:581.162.52
Cherry pollination and variety investigations in New South Wales, 1930-34.
Sci. Bull. Dep. Agric. N.S.W. 1937 : No. 55 : Pp. 51.
The results of extensive cross- and self-pollination experiments with sweet cherry varieties are described. All the varieties tested were self-incompatible. Two intra-sterile groups were found: (*a*) St. Margaret, Noble, Black Republican, Black Bigarreau; (*b*) Early Lyons, Mezel, Twyford. Napoleon was found to be cross-incompatible with Reverchon and Early Rivers with Bedford's Prolific and Black Eagle.
Brief descriptions are given of the varieties and also of certain off-type strains.

381. 634.25:575(94.4)
Two new fruits evolved.
Hawkesbury Agric. Coll. J. 1937 : **34** : p. 111.
Two new promising peach seedlings have been produced at Hawkesbury Agricultural College, one from the cross between Triumph peach and Goldmine nectarine and the other from a Triumph-Blackburn cross.

PALMACEOUS AND OTHER FRUITS 634.6

382. Pieris, W. V. D. and
Salgado, M. L. M. 634.61–1.421:519.24
Experimental error in field experiments with coconuts.
Trop. Agriculturist 1937 : **89** : 75–85.
The results are given of a uniformity trial with coconuts, based on the individual yield records for two years of 300 palms on the Bandirippuwa Estate. It is concluded that an 18-tree plot is the optimum size, the standard error of a plot this size being 8 to 9 per cent of the mean.

VEGETABLES 635

383. Luckwill, L. C. 635.64:575.125:575.127.2
Studies in the inheritance of physiological characters. IV. Hybrid vigour in the tomato. Part 2. Manifestations of hybrid vigour during the flowering period.
Ann. Bot. Lond. 1937 : (N.S.) : **1** : 379–408.
Carrying on from Ashby's work (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 878) the author deals with heterosis shewn by the F_1 hybrid between *Lycopersicum racemigerum* and *L. esculentum* var. Chinaman during the flowering period. Heterosis is exhibited by the hybrid in respect of the following characters:—Total dry weight, dry weight of stems, dry weight of leaves, leaf number, total leaf area, size of leaves, embryo weight, size of young shoot primordia and number of laterals. In characters such as growth rate of stems and leaves, efficiency index (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 878) as measured by dry weight, differential growth ratio between stem and leaf weight (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 880) relative rate of production of leaves, length of growth period, assimilation rate, height, mean internodal length and cell size of epidermis the hybrid does not differ markedly from its tall parent.
It is pointed out that growth rate in the hybrid is inherited as a dominant from the tall parent whilst heterosis is due to the maintenance on a logarithmic scale of an initial size advantage in the primordia of the embryo. Further work should be devoted to that portion of the life cycle between fertilization and seed setting in order to find out how this size advantage in the hybrid is produced.
An appendix gives details of the statistical methods employed in the treatment of the results.
J G. H.

Part II. Foreign.

STATISTICS 519

384. MALÉCOT, G. 519.2:575.11
Quelques conséquences de l'hérédité Mendélienne. (**Some consequences of Mendelian inheritance**).
C.R. Acad. Sci. Paris 1937 : **204** : 619–22.
The author's aim is to shew by means of mathematical formulae the relation, under fairly general conditions, between the proportion of the three genotypes in the F_0 and the F_1 in a case of monofactorial inheritance.

385. BAKER, G. A. 519.24
The probability that the mean of a second sample will differ from the mean of a first sample by less than a certain multiple of the standard deviation of the first sample.
Ann. Math. Statist. 1935 : **6** : 197–201.
This paper gives the probability function of a deviation in the mean of a second sample measured from the mean of a first sample in terms of the standard deviation of that sample. It thus answers the question of how much a similar series of observations could be expected to differ by chance from the set already available. The distribution can easily be transformed into "Student's" t-distribution, so that his tables can be used. J. W.

386. 519.24
BRANDT, A. E. 631.421
Factorial design.
J. Amer. Soc. Agron. 1937 : **29** : 658–67.
A comprehensive description is given of the method of statistical analysis appropriate to experiments of the factorial type. Two illustrations are provided; one is a laboratory experiment on the effect of three chemicals, and of time, on brewer's yeast fermentation; the other is a field experiment testing various cultural methods in the case of potatoes. The experiments illustrate on the one hand the obtaining of tests of significance without replication, and on the other the device of confounding for the purpose of securing increased precision in the comparisons sought to be made. J. W.

387. HENDRICKS, W. A. 519.24
Analysis of variance considered as an application of simple error theory.
Ann. Math. Statist. 1935 : **6** : 117–26.
A non-mathematical account of the essential principles of the "analysis of variance" procedure in statistics, with some details of the application of the method to practical problems, particularly where observations in a two-fold classification do not satisfy the conditions of proportionality. J. W.

BREEDING 575

388. RABAUD, E. 575
Commentaires sur l'hérédité. (**Comments on heredity**).
Bull. Biol. 1936 : **70** : 409–55.
An attack on the genetical method of investigating heredity, which the author considers should be studied by physico-chemical methods.

389. STOUT, A. B. 575:633
The origin and development of cultivated plants.
Paper Tr. J. 1936 : **102** : No. 26 : 28–42.
This lecture to the American pulp and paper industry's Technical Association deals with the introduction of plants into cultivation and with their improvement by breeding. The author's work on grape breeding is mentioned (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 322) and also breeding ornamental plants, citrus fruits and trees.

390. KONSTANTINOV, P. N. 575:633(47)
(Breeding crop plants).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1936 : No. 12 : p. 3.
A list of the various strains of crop plants bred by the author, including suggestions about varieties of spring barley for crossing. The earliness, resistance to insect pests and diseases, yielding capacity, etc., of certain varieties are specified.

391. Boss, A. 575:633(77.6)
Achievements of the Minnesota Experiment Station.
Bull. Minn. Agric. Exp. Sta. 1936 : No. 328 : 76–85.
In a section of the article on crop improvement by plant breeding, the author outlines the important part played by the station in the beginnings of plant breeding work about the turn of the century and mentions some of the achievements in field crops, hardy fruit breeding and the discovery of physiological specialization in black stem rust of wheat, *Puccinia graminis*.

392. TSCHERMAK-SEYSENEGG, E. 575:633:061(43.6)
Zum 25 jährigen Bestehen der Gesellschaft für Pflanzenzüchtung "Z" Wien.
(The 25th anniversary of the founding of the "Z" Society for Plant Breeding, Vienna).
Züchter 1937 : 9 : 137–44.
An account of the founding and activities of this society. A list of the papers read and visits made at the annual meetings is given.

393. 575:633:061.3
MEISTER, G. K. 63.00.15(47)
(Summary of the discussion on questions of genetics and breeding).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 3 : 25–35.
Already reviewed in "Plant Breeding Abstracts", Vol. VIII, Abst. 66.

394. 575:633:061.3(47)
(Problems of the December Session).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1936 : No. 12 : 1–3.
An account of the fourth Session of the Academy of Agricultural Sciences (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 65) at which the achievements of the U.S.S.R. in the breeding of plants and livestock were surveyed. The present Russian view point (as represented by the exponents of dialectical materialism) with regard to theories on the nature of life, evolution and genetics, with special reference to the problem of the mutability of the gene and its relation to the environment is emphasized.

395. BAKHAREV, A. N.,
BELOKHONOV, I. V. and
ODINTSOV, V. A. 575:633:061.3(47)
(The reconstruction of the science of plant breeding and genetics for the promotion of the greater support of industry by science).
Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods. Bull. Lenin Acad. Agric., Sci. Res. Inst. Fruit Grow. I.V. Michurin) 1937 : No. 1 : 3–9.
Mainly a report of the proceedings of the 4th Session of the Lenin Academy of Sciences (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 65) at which emphasis was repeatedly laid upon the need for combining science and practice to obtain results of value for the future development and prosperity of the U.S.S.R.

396. Delaunay, L. N. 575:633:575.24
(The significance of mutational change in practical breeding).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of of the Lenin Academy of Agricultural Sciences) 1936 : No. 12 : 4–5.
A plea for a more extensive use of induced or spontaneous mutations in breeding new varieties.

GENETICS 575.1

397. Rudorf, W. 575.1
Entwicklungstendenzen in der Pflanzenzüchtung. **(Trends in the development of plant breeding).**
Forschungsdienst 1937 : **4** : 153–62.
A lecture briefly reviewing the progress of plant breeding from the results of selection practised before 1900 and the stimulus given to hybridization by the re-discovery of Mendel's work to the successes and problems of the present day.

398. Tschermak-Seysenegg, E. 575.1
Erinnerungen an die Wiederentdeckung der Mendel'schen Vererbungsgesetze vor 37 Jahren. **(Reminiscences of the rediscovery of the Mendelian laws of heredity 37 years ago).**
Züchter 1937 : **9** : 144–46.
Personal notes on the author's part in the famous re-discovery. He points out that he immediately recognized the practical significance of the laws.

399. Boyden, A. 575.1:576.12
Genetics and homology.
Quart. Rev. Biol. 1935 : **10** : 448–51.
It is pointed out that the taxonomist's conception of homology is supported by genetics.

400. Hagedoorn, A. L. 575.115
Die Natur der Erbfaktoren bei rezessiven Merkmalen. **(The nature of the inheritance factors in recessive characters).**
Z. indukt. Abstamm.- u. VererbLehre 1937 : **73** : 476–78.
Cases are cited in support of the presence–absence hypothesis.

401. Hagedoorn, A. L. 575.115
The nature of recessive genes and the biomechanic theory of inheritance (presence-absence hypothesis).
Genetica 1937 : **19** : 434–45.
The author enters a plea in support of the presence-absence hypothesis, the recessive factor being considered to represent the absence of a part or the whole of the dominant gene. Evidence derived from sex-linked inheritance in poultry is given in support.

402. Darlington, C. D. 575.12
What is a hybrid ?
J. Hered. 1937 : **28** : p. 308.
In this letter to the editor the genetical definition of a hybrid is given as "a zygote produced by the union of dissimilar gametes (or which by mutation has the character of such a zygote)."

403. Griggs, R. F. 575.12:576.1
Hybridity as a factor in evolution.
J. Wash. Acad. Sci. 1937 : **27** : 329–43.
The problem of the part played by hybridization in the evolution of new species is discussed and illustrated from the results obtained in the introduction and breeding of new forms of *Canna* for horticultural purposes.
The sequence of events concerned in the production of new types appears in general to follow a course which can be divided roughly into three stages (1) the collection of a number of the

wild species, (2) hybridization with the consequent segregation and recombination according to mendelian laws and (3) the sudden appearance of a number of new and unexpected forms as the result of further crosses.
The importance of polyploidy in the production of new forms is noted and the need for further research on the relation of polyploidy and chromosome aberration to hybridity is pointed out.

404. Ashby, E. 575.125
The physiology of heterosis.
Amer. Nat. 1937 : **71** : 514–20.
A reply to criticisms of the author's work (Cf. "Plant Breeding Abstracts", Vol I, Abst. 12; Vol. III, Abst. 148 and Vol. VII, Abst. 878) offered by East (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 100).

405. Tschermak-Seysenegg, E. 575.127.2:581.163:575.129
Über Jungfernzeugung nach Artkreuzung (hybridogene Parthenogenesis).
[**On parthenogenesis after species crossing (hybridogenous parthenogenesis)**].
Forsch. Fortschr. dtsch. Wiss. 1935 : **11** : 413–14.
The three ways of inheritance, the free or the linked mendelian inheritance, the intermediate constant hybridization produced by chromosome addition and apparent parthenogenesis (the so-called hybridogenous pseudo-parthenogenesis) brought about by species crossing are briefly described and are taken as representing a biologically important series indicating the degree of relationship of the forms used in crossing.

406. Wettstein, F. v. 575.182:581.174
Die genetische und entwicklungsphysiologische Bedeutung des Cytoplasmas.
(The genetical and developmental-physiological importance of the cytoplasm).
Z. indukt. Abstamm.- u. VererbLehre 1937 : **73** : 349–66.
The part played by the plastids has been clearly defined by the work of Baur and Renner and proves that the nucleus does not possess the monopoly of inheritance. Of the question of cytoplasmic inheritance apart from the plastids much less is known and the difficulties of investigation are much greater.
The differences in reciprocal crosses (when the parents are homozygous and sex-linked inheritance and heteroploidy are excluded) can only be caused by the cytoplasm. The evidence in both plants and animals for the existence of a plasmon, a carrier of inheritance independent of the nucleus is discussed and in particular the work of Michaelis (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 600) is reviewed and criticized.
The significance of the cytoplasm and its interaction with the nucleus from a developmental-physiological point of view is briefly discussed.

407. Kostoff, D. 575.182:631.541:615.37:575.127.2
On the mutual reactions between plant extracts and between heteroplastic graft components and their biological significance.
Biol. Gen. 1937 : **13** : 217–75.
A critical survey of the data on the mutual reactions between plant extracts and between graft components of heteroplastic grafts from a biological, genetical and immunological point of view.
It is suggested that the poor development of hybrid seeds noted in certain species crosses (Cf. *Nicotiana* and *Triticum*) may be due to the action of the maternal tissues on the developing embryo and similar to the reaction which occurs in heteroplastic grafts. Such a reaction may be the cause of what is now regarded as cytoplasmic inheritance.

408. Imai, Y. 575.182.061.633:581.174:633.79
Is the variegation of *Humulus japonica* due to defect cytoplasm ?
Z. indukt. Abstamm.- u. VererbLehre 1937 : **73** : 598–600.
It is suggested that the variegation of the Japanese variegated hop *H. japonica* is the result of mutable genes (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1157) and is not a case of cytoplasmic inheritance.

409. Sirks, M. J. 575.242
Mutation, what it means.
Ber. der 12. Versammlung Int. Fed. Eugen. Organ. Holland 1936 : 68–74.
After indicating the possibility of confusing *Dauer*-modifications and complex segregations with mutation, the author classifies mutation into two types, chromosome and gene and points out that a small chromosomal disturbance such as might be produced by unequal crossing-over, might simulate a gene mutation.

410. Sax, K. 575.243:576.356.5:581.036
The experimental production of polyploidy.
J. Arnold Arbor. 1936 : **18** : 153–59.
Diploid pollen grains were induced in plants of *Rhoeo discolor* by subjecting the plants to either high or low temperatures but more consistent results were obtained by keeping the plants first at a low temperature (10° C.) and then transferring them to a high temperature (36° C.) Diploid pollen grains were also produced in *Tradescantia* by this method when high and low temperature alone rarely had any effect.
The effect of variations in the temperature as a cause of polyploidy in nature is discussed in relation to the distribution and centres of origin of cultivated plants.

411. Kostoff, D. 575.243:578.088.2:633.71
Chromosome alterations by centrifuging.
Science 1937 : **86** : p. 101.
In addition to the results already described (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 222, Vol. VI, Abst. 455 and Vol. VII, Abst. 1327) the author reports obtaining in *Nicotiana Langsdorffii* a variegated plant in the second generation after treatment; it gave green, white and variegated plants in the next generation in various ratios according to the capsule from which seed was collected. Chromosome mutations of the types already reported were also obtained in *Crepis capillaris* by centrifuging germinating seeds.

412. Wright, S. 575.4:575.242:575.12
The distribution of gene frequencies in populations.
Proc. Nat. Acad. Sci. Wash. 1937 : **23** : 307–20.
The effects of mutation, cross-breeding and selection are treated mathematically. The author emphasizes the importance of isolation as an evolutionary factor and concludes that mutation, though an important factor in providing material for evolution, may be said to dominate the course of evolution only in so far as mutants appear which are fertile *inter se* but largely infertile with the parent type, i.e. when mutation is itself an isolating factor.

413. Haldane, J. B. S. 575.41:575.242
The effect of variation on fitness.
Amer. Nat. 1937 : **71** : 337–49.
A mathematical investigation of the effects of different types of variation on fitness, the fitness of any particular genotype being defined as half the mean number of progeny left by an individual of that genotype.

414. Sirks, M. J. 576.16:575.1:576.312
Het genetisch soortbegrip. (**The genetical concept of the species**).
Hand. 25e Ned. Nat.- en Geneesk. Congr. 1935 : 142–44.
An abbreviated form of the paper reviewed in "Plant Breeding Abstracts", Vol. VI, Abst. 1162.

CYTOLOGY 576.3

415. Curt and Kosswig, L. 576.312.32:575
Beziehungen zwischen Genetik und Chromosomenstruktur. (Sammelreferat). [**The relation between genetics and chromosome structure. (Review of literature)**].
Züchter 1937 : 9 : 199–218.
The work on the structure of the chromosomes of the salivary glands of insects is reviewed in some detail with special reference to its bearing on cyto-genetical problems.

416. Buchinger, A. 576.341:575
Welche Fragen auf dem Gebiete der Saugkraftbestimmung bedürfen noch einer weiteren Prüfung? (**Which questions in the field of suction pressure determination still require further examination?**).
C.R. Ass. Int. Essais Semences Copenhagen 1934 : No. 2 : 479–82.
The author examines five points which have been raised in connexion with his work on suction pressure in relation to breeding. He concludes that the values obtained by germinating seeds in sugar solutions actually give a measure of the suction pressure and that this can be taken as representative of the mature plant value. The suction pressure of the embryo appears to be little affected by the endosperm or other reserve tissue. Suction pressure is inherited, but more work is needed on the effect of provenance of the seed and on the possible linked characters.

417. Sax, K. and 576.356.5:581.49
Sax, H. J. 634.11:576.356.5
Stomata size and distribution in diploid and polyploid plants.
J. Arnold Arbor. 1937 : 18 : 164–72.
There was a marked relation between chromosome number and size of pollen cells, microspores, stomata, chloroplasts and stomata frequency in diploid and tetraploid species of *Tradescantia cassaliculata*. The diploid and tetraploid species do not differ in size but the cells of the tetraploid are twice as large and therefore this form has only half as many cells as the diploid. It therefore follows that the rate of cell division must be slower in the tetraploid. The number of major spirals in the meiotic chromosomes is considerably less in the tetraploid.
The rate of cytoplasmic streaming was more rapid in the diploid. Stem cuttings from the tetraploid plants rooted better than those from diploid plants. The value of stomata frequency as an index of polyploidy is discussed. Positive correlation was found in diploid and tetraploid races of *Secale* and other plants. From the data available it would seem that both diploid and tetraploid races exist in the following species of *Malus* –*M. angustifolia*, *M. coronaria*, *M. fusca*, *M. glaucescens*, *M. baccata* and *M. Halliana* and in certain species of *Vaccinium*.

418. 577.7:537.531
Gustafsson, Å. 633.16:575.242.061.633:537.531
Ett genetiskt bevis för den differentiella celldödligheten. (**A genetical proof of differential cell mortality**).
Bot. Notiser 1937 : 309–10.
Grains of Gull barley, a pure line of two-rowed *Hordeum distichum nutans* treated with X-rays produced 5 classes of chlorophyll mutation: albina, xantha, viridis, tiger and albo viridis (differently coloured at base and apex). Macro- and micro-mutations occurred in each class.

The irradiations were made on grains which had been dried to a low water content and others which had been steeped in water.
The results lead to the conclusion that grains with high water content are more easily killed than grains with low water content. Other experiments indicate that cells which have started mitosis are more easily killed than other living cells.

EXPERIMENTAL TECHNIQUE 578.08

419. Schwarze, P. and
Sengbusch, R. v. 578.081:575
Eine Methode zur Bestimmung des Rohproteingehaltes in Zuchtmaterial. (**A method for the determination of the crude protein content in breeding material**).
Züchter 1937 : **9** : 256–66.
Details are given of methods for the preparation of the raw material, grain, seeds, tubers, roots, etc. and of the methods for the estimation of the protein content. The colorimetric and the distillation methods were both tried for the determination of the total nitrogen and the distillation method was almost exclusively adopted followed by the Kjeldahl method for the estimation of the organically combined nitrogen.

BOTANY 58

420. Gardner, F. E. and
Marth, P. C. 581.163
Parthenocarpic fruits induced by spraying with growth-promoting chemicals.
Science 1937 : **86** : 246–47.
Parthenocarpy was induced by spraying pistillate flowers of holly (*Ilex opaca*) and strawberry with dilute aqueous solutions of indoleacetic acid and other growth-promoting chemicals. No success was obtained with the Starking apple or Brighton grape.

421. Gustafson, F. G. 581.163:577.17
Parthenocarpy induced by pollen extracts.
Amer. J. Bot. 1937 : **24** : 102–07.
Chloroform extracts of the pollen of various plants applied to the stigmas or cut styles of the same or different species, produce in many cases a swelling of the ovary although no seed is set. It is concluded that growth promoting substances possibly identical with some of the growth hormones are normally liberated by the pollen grains and that later, the developing ovules, ovary wall or placentae may produce such substances. J. G. H.

422. Gandrup, J. 581.165
Wat is een cloon? (**What is a clone ?**)
Bergcultures 1936 : **10** : 1531–37.
A report of a lecture in which sexual and vegetative reproduction are defined; the term clone is explained and methods of obtaining clones are described including grafting and possible ways of obtaining grafted clones in which both scion and stock are from the same clone.
The expression clonal seed plantation is interpreted and the possible relations between graft and scion in such plant material is considered as well as the value of clones as a means of fixing desirable characters.

423. Caryl, R. E. 581.165:001.4
The designation of clonal generations.
Science 1937 : **86** : p. 156.
The author suggests the use of the symbols C_1, C_2, C_3 etc. to designate the "generations" obtained by vegetative propagation.

424. Engelke, H. 581.192:578.081:575
Bedeutung der Eiweissbestimmung für die Züchtung und Versuche zur Entwicklung einer Mikroschnellmethode. (The importance of protein determination for breeding and research on the development of a rapid micro-method).
Landw. VchSta. 1937 : **128** : 161–90.

The possibilities for increasing the protein content of crop plants are discussed. Breeding varieties with high protein content has several advantages over the method of increasing the manuring of existing varieties and therefore it is essential to discover a rapid method for the estimation of nitrogen to enable the breeder to select the desirable types in the short period between harvest and winter sowing.
A modified Kjeldahl method is described in detail which requires only 0·5 g. of material and which can be carried out in much less time.
The method is sufficiently accurate for the requirements of the plant breeder.

PLANT PATENTS 608.3

425. Fay, A. E. 608.3
Are plant patents "inventions"?
J. Hered. 1937 : **28** : 261–62.

The author points out that the U.S. Statute relating to patents covers discoveries as well as inventions. He suggests that it ought to be broadened to cover the invention or discovery and reproduction of "any distinct and new breed or variety of plant or domestic animal or bird which breeds 75 per cent true, in cases sexually reproduced. . . .".

FIELD TESTS 631.421

426. Immer, F. R. 631.421
Correlation between means and standard deviations in field experiments.
J. Amer. Statist. Ass. 1937 : **32** : 525–31.

An examination of a large number of field experiments shewed that an inherent negative correlation exists generally between the mean yield of plots and the standard deviation of samples within such plots for uniformity trial data. It appears also that the mean yields and standard deviations of varieties or strains of crop plants tested in replicated field experiments are essentially independent. Little correlation can be expected between means and standard errors of different experiments conducted in different years or in different parts of the State, under the conditions of such experiments. J. W.

427. Papadakis, J. S. 631.421
(Experiments and improvements in the method of pockets for variety trials).
Bull. Sci. Inst. Amélior. Plantes, Salonique 1937 : No. 27 : Pp. 32.

Sowing in plots is compared with sowing individual grains in pockets and certain modifications of the latter method are suggested.
The "pocket" method allows comparisons to be made between the progeny of a single plant.

428. Wiebe, G. A. 631.421:633.11
The error in grain yield attending misspaced wheat nursery rows and the extent of the misspacing effect.
J. Amer. Soc. Agron. 1937 : **29** : 713–16.

In an experiment in which Federation wheat was sown from a drill in rows 12 inches apart, the distance between border rows of adjacent drill strips varied from 7 to 17 inches. Using a moving average, based on the yield of the correctly spaced rows inside the drill strips, to eliminate the effect of varying soil fertility, the regression of yield of the border rows on space between drill strips was calculated and a significant value of 3·8 per cent per inch was found. Over the range studied the regression was linear. The yield of the penultimate rows of the drill strip was not affected.

429. 632

Woronin, M. S.

***Plasmodiophora brassicae* the cause of cabbage hernia.**

Phytopath. Class. 1934 : No. 4 : Pp. 32.

Tillet, M.

Dissertation on the cause of the corruption and smutting of the kernels of wheat in the head and on the means of preventing these untoward circumstances.

Phytopath. Class. 1937 : No. 5 : Pp. 189.

The American Phytopathological Society has issued two more volumes in continuation of the series of Phytopathological Classics of which the first three have already been reviewed (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 618). No. 4 is a translation of the original paper by Woronin and describes the researches which led to his discovery of *Plasmodiophora brassicae* as the cause of club root or finger-and-toe. There is also a short biography of Woronin by the translator.

No. 5 is a translation of the dissertation by Tillet, published in 1755, and contains a discursive account of his experiments in the investigation of the cause of smutted wheat. Rejecting earlier and contemporary explanations he reached the conclusions that contamination by bunt dust is the cause of the disease. It was not till later that the real nature of the dust was discovered by Prévost.

430. Winge, Ö. and

Laustsen, O. 632.422.3:575.11

On two types of spore germination, and on genetic segregations in *Saccharomyces*, demonstrated through single-spore cultures.

C.R. Lab. Carlsberg 1937 : **22** : Sér. Physiologique : 99–116.

The press yeast studied, ascribed to *Saccharomyces ellipsoideus*, sporulates readily and the four ascospores can be isolated and cultivated separately.

Diploidization normally occurs at the time of spore germination by conjugation of pairs of spores but the isolated spores may germinate in two ways, either (1) with small, spherical, haploid cells (*Torula*) which may later conjugate to form zygotes giving elongated, diploid cells or (2) directly with elongated diploid cells, a nuclear fusion having taken place immediately at the germination of the spore. Cultures arising in this way are completely homozygous.

Genetic segregation occurring at ascospore formation was demonstrated by cultivating giant colonies on gelatine from the individual ascospores of one ascus. The type of segregation for macroscopic characters indicated that more than one gene was concerned.

It is emphasized that a culture derived from a single vegetative cell of a *Saccharomyces* species is not necessarily a pure culture, owing to the possibility of spore formation and consequent segregation.

431. 632.451.2:576.16:575.11

Allison, C. C. 632.451.2:575.127.2:633.16

Studies on the genetics of smuts of barley and oats in relation to pathogenicity.

Tech. Bull. Minn. Agric. Exp. Sta. 1937 : No. 119 : Pp. 34.

Further evidence of the presence of physiological races in *Ustilago hordei* on barley is presented. The segregation of sex and cultural characters was studied in intraspecific crosses and also in interspecific crosses between *U. hordei* and *U. medians*. These two forms were found to hybridize readily and to give in F_2 dicaryophytes which were more virulent than the parent dicaryophytes on certain varieties. Sporidial fusions were produced between these two smuts and *U. avenae*, *U. levis* and *U. tritici*, but the dicaryophytes produced were apparently incapable of producing infection.

Discussing the significance of the results for the breeding of resistant varieties, the author points out that there are three smuts on barley, *U. nuda, U. hordei* and *U. medians*, physiological races exist within the species and that new races can arise both by inter- and intraspecific crosses.

432. 632.452:576.16
633.16–2.452–1.521.6:575
STRAIB, W. 633.452 *Puccinia simplex*
Die Bestimmung der physiologischen Rassen des Gerstenzwergrostes, *Puccina simplex* (Kcke.) Erikss. et Henn. [**The determination of the physiological races of dwarf rust of barley, *P. simplex* (Kcke.) Erikss. et Henn.**]
Arb. biol. Reich. Land- u. Forstw. Berl. **1937** : **22** : 43–63.

As a result of experiment with a test assortment of ten varieties of barley, fourteen different races of dwarf rust were distinguished, ten of which are found for the first time. The five races already identified by Hey in Germany were not determined again. The total number of races of dwarf rust has therefore been increased to nineteen excluding eight races not found in Europe.

As parents for breeding resistant varieties of barley the four-rowed barleys JLB No. 3036 (Spanish) *Hordeum tetrastichum coerulescens* and JLB No. 3041 (Palestine) *H. tetrastichum coerulescens* and JLB No. 3119 and C1 1020 (*H. tetrastichum pallidum*) can be recommended as shewing resistance or moderate susceptibility to most of the races of dwarf rust.

433. 632.452:576.16
STRAIB, W. 633.1–2.452–1.521.6
Die Untersuchungsergebnisse zur Frage der biologischen Spezialisierung des Gelbrostes (*Puccinia glumarum*) und ihre Bedeutung für die Pflanzenzüchtung. [**The results of investigations into the problem of the biological specialization of yellow rust (*P. glumarum*) and their significance for plant breeding**].
Züchter **1937** : **9** : 118–29.

A comprehensive survey of the results obtained by the author and his colleagues on the above problem since 1927.

The distribution of the physiological forms, which now number 38, in Germany and other countries and their association with certain varieties of the cereals, especially wheat, are discussed. The different races of the fungus can be divided into groups, the most aggressive member of which can be taken as representative of the others in testing for resistance. This is likely to simplify greatly the work of breeding for resistance. Distant hybridization does not appear likely to play an important part in breeding for resistance, since the related genera of the *Gramineae* are no more resistant than the cultivated cereals. There is, however, no lack of cultivated wheat varieties shewing resistance to numerous physiological forms and it is mentioned that the following wheats have been proved resistant without exception, in tests involving nearly all known races: *Triticum Spelta album, T. durum Schimperi, T. dicoccum macratherum, T. dicoccoides spontaneonigrum, T. monococcum flavescens* and *T. aegilopoides boeoticum.*

Diminished susceptibility under field conditions has been shewn to be largely due to high temperature. Field resistance can be distinguished from immunity and absolute resistance in the presence of smut (*Tilletia*) infection, which increases susceptibility in the case of field resistance only.

The author concludes with the statement that from the genetical point of view there are no special difficulties to be expected in the combining of resistance to yellow rust with other characters and that systematic crosses, with artificial infection tests, will lead to the development of resistant strains of wheat and barley.

434. 632.452 *P. coronata*:576.16
STRAIB, W. 633.13–2.452–1.521.6
Die Bestimmung der physiologischen Rassen von *Puccinia coronata* Cda auf Hafer in Deutschland. (**The determination of physiological races of *P. coronata* Cda on oats in Germany**).
Arb. biol. Reich. Land- u. Forstw. Berl. 1937 : **22** : 121–57.

Using a new test collection, 139 physiological races of crown rust, *P. coronata*, were identified. The numerous varieties of *Avena sativa* are almost all susceptible to the races of crown rust. *A. fatua* plays an important part not only as a host for specialized races of the rust but also in harbouring races which are less virulent on *A. sativa*. On the basis of American work and the present results it is considered that the divisions of the old *P. coronata* Corda into *P. coronata* (Cda) Kleb. and *P. coronifera* Kleb. can no longer be maintained.

435. 632.452 *P. glumarum*:576.16
STRAIB, W. 633.1–2.452–1.521.6:575
Untersuchungen über das Vorkommen physiologischer Rassen des Gelbrostes (*Puccinia glumarum*) in den Jahren 1935–36 und über die Aggressivität einiger neuer Formen auf Getreide und Gräsern. Mit einer Nachschrift "Unterschiede in der Keimungsweise der Uredosporen physiologischer Rassen von *Puccinia glumarum*". [**Investigations on the occurrence of physiological races of yellow rust (*P. glumarum*) in the years 1935-36 and on the virulence of some new forms on cereals and grasses. With an appendix "Differences in the germination of the uredospores of physiological races of *P. glumarum*".**]
Arb. biol. Reich. Land- u. Forstw. Berl. 1937 : **22** : 91–119.

Four new races were found among 222 samples tested. A characteristic distribution for the various countries was noted. Among the new races of yellow rust found during 1935 and 1936 were some capable of severely infecting rye, and certain wild grasses such as *Agropyrum repens* and *Hordeum murinum*.
Although probably unable to infect German wheats and barleys these races can attack certain foreign varieties. These experiments tend to confirm Eriksson's opinion that *P. glumarum* is to be regarded as a continuous variation series of specialized forms.
Crosses of wheat with *Agropyrum* and *Haynaldia* and of barley with the wild *Hordeum* are therefore unlikely to offer a very promising outlook for breeding for resistance to *P. glumarum*.

436. 632.452:576.16(43.8)
RALSKI, E. 633.11–2.452–1.521.6:575
Rozpowszechnienie i rasy biologiczne rdzy brunatnej pszenicy *Puccinia triticina* Erikss. w Polsce. (**The distribution and physiological forms of brown rust of wheat *P. triticina* Erikss. in Poland.**)
Roczn. Nauk Rol. 1937 : **38** : 112–33.

Brown rust of wheat is very general in South Poland where it probably overwinters in the uredospore stage. The author has identified five physiological forms, 13, 18, 20, 22 and 24. Of all Polish spring and winter wheats and about 300 foreign varieties of *T. vulgare* no variety highly resistant to the physiological forms of brown rust occurring in Poland was found. The only solution is the breeding of resistant varieties and for the purpose 28-chromosome wheats and foreign varieties must be employed.

437. HUMPHREY, H. B.,
JOHNSTON, C. O. and
CALDWELL, R. M. 632.452:576.16:001.4
A revision of the numbers assigned to physiologic races of the leaf rust of wheat, *Puccinia triticina* Eriks.
U.S. Dep. Agric. Bur. Pl. Ind., Div. Cereal Crops & Diseases, Washington, D.C. September, 1936 : Pp. 14.

A proposed standard numbering of 86 races of *P. triticina* is given, with a key for the identification of the races.

438. Ogan'jan, V. N. 633:575"793":581.143.26
(On a method of obtaining early forms).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 3 : 35–36.

Referring to his previous note (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 819), the author records the following findings based on a series of crosses:—

In selecting parents to obtain early forms a most important feature to be considered is the differences in their several periods of phasic development. Difference in the periods of two or three stages in the parents suffice to obtain an early segregate; and the segregation affects all the stages of development, thus indicating the polymeric nature of the component characters (i.e. phases) of the vegetative period and their close interdependence.

The bearing of this theory on drought and cold resistance and the necessity for a thorough study of phasic development as a basis for the selection of suitable combinations in breeding for these forms of resistance is emphasized.

439. Karpačev, V. S. 633:575.127:581.331.23
(The limits of crossability and the causes of non-crossability).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1936 : No. 12 : 22–24.

The work of Michurin and Meister have proved the value of interspecific and intergeneric hybridization. The work of Kostoff and Prokof'eva on the roles of pollen tube growth and chromosome number in determining the failure or success of wide crosses in tobacco (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 226) is supported by interspecific crosses of *Fragaria*, by the crosses of the blackberry and raspberry made by Kuzmina and by Osterwalder's findings on pears, all of which demonstrate the importance of studying pollen tube growth in hybridization.

From his findings in an attempt to cross the woodland strawberry with the Marlborough raspberry, the author concludes that it is possible to predict the success or failure of pollination under natural conditions from the relative length of the pollen tubes determined in an artificial medium.

440. 633:581.5:581.9(47)
633.71:575(47)
(Papers on the taxonomy, ecology and geography of plants).
Bull. Appl. Bot. Leningrad 1937 : Ser. I (2) : Pp. 368.

The following papers in this collection may be cited as of potential interest to those interested in the resources of the U.S.S.R. as regards economic plants:—*Wild growing edible plants of the Caucasus* by G. N. Voronov; *Geographical regularities in the distribution of cultivated Phaseolinae* by G. N. Voronov; *The fibre plant* Gomphocarpus fruticosus (*L.*) *R. Br. in Transcaucasia* by V. L. Nekrassova; *The rubber bearing plants of the western Thian-Shan mountains* by N. V. Pavlov; *On the area of Tau-saghyz*, by A. Zaitzeva and N. Belchikova; *An essay at dividing the world into phytogeographical regions according to the numerical distribution of species* by E. V. Wulff; *The family* Cunoniaceae *and its possible importance for tanning purposes*, by G. N. Voronov; and *A contribution to the knowledge of the genus* Nicotiana *L.* by A. N. Grabovetzkaya. In the last-named paper the use of wild species of *Nicotiana* from North and South America is recommended in breeding species adapted to the varied conditions and requirements of the U.S.S.R.

Though not of economic importance, attention may also be drawn to V. A. Moniuszko's paper on the sexual forms of flowering plants and regularities of their geography and origin.

441. 633–1.521.5
Snell, K. 633.00.14
Entwicklung und Bedeutung der Sortenkunde landwirtschaftlicher Kulturpflanzen. **(The development and significance of the knowledge of varieties of agricultural plants).**
Biologe 1937 : **6** : 309–11.

The work of the Biologische Reichsanstalt on the identification of varieties is briefly reviewed.

In the control of wart disease of the potato it is of particular importance to be able to distinguish between varieties and for this the method of germinating the tubers in the light has been developed. The characters of the sprouts so produced combined with those of the tuber make varietal identification possible.
For cereals the best characters are those of the ear and panicle. In wheat the colour and pubescence of the seedlings are used as well as the colour of the grains, the glumes and the straw after treatment with a 1 per cent phenol solution. Sugar and forage beets are distinguished on the basis of their seedling characters. The methods are being extended to include some horticultural plants and it is hoped in time to build up a complete varietal knowledge of the plants cultivated in Germany.

442. 633–2–1.521.6
STAKMAN, E. C. 633.11–2.452–1.521.6
The promise of modern botany for man's welfare through plant protection.
Sci. Mon. N.Y. **44** : February 1937. Also Trop. Agriculturist 1937 : **89** : 89–114.
A large part of the article is devoted to problems of breeding for disease resistance, with special reference to stem rust resistance in wheat.

443. KÖHLER, E. 633–2–1.521.6:575
Anbau und Züchtung krankheitswiderstandsfähiger Sorten. (**The cultivation and breeding of varieties resistant to disease**).
Biologe 1937 : **6** : 316–18.
A brief review of the work of breeding disease-resistant varieties of economic plants, its importance, present success and future problems.

444. BARRONS, K. C. 633–2.6–1.521.6
Development of root-knot-resistant varieties of crop plants.
Plant Dis. Reporter 1937 : Suppl. 102 : 115–17.
Strains of beans resistant to the root-knot nematode have been developed in Alabama from seed collected by farmers and are being used in the breeding of resistant types desirable commercially.
Iron and Couch varieties of cowpeas have been shewn to possess some resistance and are being used in the breeding of resistant types. The resistance of Iron has been found to be dominant but not inherited in simple Mendelian fashion.
Varietal differences in resistance are mentioned in lima beans, potatoes, sweet potatoes, tomatoes, peaches, plums, cherries and almonds.
Seedling tests for resistance now used with beans, lima beans and cowpeas help to accelerate the breeding work.

445. WEIDEMANN, M. 633–2.8–1.521.6
(**Modern problems in phyto-immunity and breeding for immunity against fungous diseases**).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (11) : 227–58.
A survey of the main aspects of the problem of plant immunity as reflected in European and American literature up to 1933. The subject is treated under the following heads: the concept of immunity and the nature and types of resistance; physiological races; pseudo-immunity; environmentally induced changes in the type of infection; resistance and protective substances in the plant; acquired immunity; genetic investigations and their practical utilization.

446. RISCHKOW, L. W. 633–2.8–1.521.6:575
Ultravirus und immunität. (**Ultra virus and immunity**).
Rep. 3rd Int. Congr. Comp. Path., Athens 1936 : **1** : Pt. 2 : 153–66.
The individual resistance of a plant depends largely on the age of the plant, the embryo being, for instance, immune.

Experiments shew that apparent individual resistance is broken down by repeated inoculation. Only in very few cases, e.g. sugar cane, have varieties shewn resistance to a particular form of virus disease.
The type of resistance may differ considerably in different varieties. As a rule the variety is only resistant to a definite virus but it is possible by hybridization to combine resistance to two viruses. Selection may also be used to produce resistant strains.
Crossing between different species where one is resistant may also lead to the production of resistant forms as in the case of *Nicotiana glutinosa* x *N. paniculata*.
The author goes on to discuss the little-known nature and causes of immunity.

CEREALS 633.1

447. MAYR, E. 633.1:551.563:575
Alpine Landsorten in ihrer Bedeutung für die praktische Züchtung. (Alpine land varieties and their importance for practical breeding).
Forschungsdienst 1937 : **4** : 162–66.

After a definition of a land variety, the distinction is made between the primitive land races, closely resembling the original form and possessing both recessive and dominant genes and the secondary or derived land races which represent degenerate breeding forms.
A consideration of the primitive forms of cereals found in the Alpine districts shews the region to be a small scale gene centre, possessing many valuable economic characters.
These land races have also the advantage over races imported from the gene centres of Asia that they are already adapted to the climate. For these and other reasons the Alpine districts should be systematically investigated with a view to practical improvements in cereal breeding.

448. 633.1:575(75.2)
633.11 Leapland
KEMP, W. B. 633.16:581.46:575.061.5
New grains and hybrids.
Rep. Md Agric. Soc. 1935 : **20** : 242–47.

At present three varieties of wheat are required for the conditions occurring in different parts of Maryland, Fulcaster for the coastal plain and low valleys, Fultz for the high areas of the Piedmont Plateau and Leap for the areas intermediate in elevation and air drainage. From the variety Leap, two strains have been selected which shew promise of replacing all other wheats throughout the State. One of them has been distributed under the name Leapland.
Smooth-awned winter hardy barley strains have been bred by selection in the field from the cross between Velvet and Tennessee Winter. The best of these strains has yielded over 20 per cent more grain and straw than Tennessee Winter. Breeding for increased winter hardiness is still in progress.
The breeding work with field maize has been delayed through lack of space.

449. KOSTOFF, D. and 633.1:575.127.5:576.354.4
ARUTIUNOVA, N. 633.11:575.127.5:633.14:633.289
Studies on polyploid plants XIV. The behaviour of *Haynaldia* genom in the trigeneric triple hybrid (*Triticum dicoccum* x *Haynaldia villosa*) x *Secale cereale*.
Genetica 1937 : **19** : 367–69.

The triple hybrid had 28 chromosomes, having arisen from an unreduced gamete of the F_1 hybrid *T. dicoccum* (n = 14) x *H. villosa* (n = 7). At meiosis there were usually 28 univalents, though occasional bivalents and trivalents were found, possibly due to autosyndesis. It is concluded the *Haynaldia* genom V shews no affinity with the A or B genom of *T. dicoccum* nor with the S genom of rye.
Dyad formation was observed in the triple hybrid and there is therefore a possibility of obtaining a fertile trigeneric allo-octaploid hybrid with the genom formula AABBVVSS.

450. Barmenkov, A. S. 633.1–2.452–1.521.6:578.08
(A "micro-chamber" for estimating the resistance of cereals to rust).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1937 : No. 3 : 29–30.

The portable apparatus described is intended for use in breeding experiments where economy of the plant material for testing is essential. The outfit is stated to be inexpensive, renders the work of testing for rust resistance independent of environmental conditions and avoids the dissemination in the neighbourhood of infection by new races of the fungus. The main advantage, however, is that resistance to 6 different races of the fungus can be carried out simultaneously and by infecting a single leaf instead of an entire plant. Essentially the apparatus consists of a glass tube 3 cms. in diameter and comprising 6 compartments by means of which the six corresponding areas of the leaf in them can be respectively subjected to infection by 6 forms of the pathogen.
Details of the method of use of the "micro-chamber", which is said to have given satisfactory results in 1936, are included.

451. Beliayev, J. and Kharchenko, V. 633.1–2.7–1.521.6
(Characters of cereals indicating their resistance against infestation by *Oscinosoma frit* L.).
Plant Protection, Leningrad 1936 : No. 10 : 50–60.

Wide differences exist in the resistance of various cereals and their varieties to *Oscinella (Oscinosoma) frit* L. Resistance is of two kinds: (1) resistance to injury, and (2) resistance to infestation. The first type is conditioned by varietal characteristics, and by agronomic and physiological factors. Late sowing decreases resistance, while vigorous tillering, especially where a large number of uniform tillers are formed, increases resistance.
The second type of resistance is correlated with the presence of a coleoptile that is closely adpressed to the stem, marked pubescence of the leaf sheath and blade, rapid growth and development of the stems, relatively long leaf sheath and a relatively high degree of hardening of the young stems. Plants in which the coleoptile is adpressed to the main stem may, it is true, offer favourable sites for egg-laying but not necessarily for infestation, since factors such as the phase of development which the plant has reached, weather conditions and the retention of the eggs in the position where they have been laid also play a part in determining the result of the attack.
Instances of susceptible and resistant varieties of cereals are cited in support of the above findings and the anatomical basis of resistance is discussed at some length.
In selecting for resistance, plants should be chosen with stems relatively firm, thin, rounded and hard, and with leaf sheaths that are mostly long and relatively coarse, and frequently markedly ribbed. Moreover in the resistant plant the mesophyll cells of the leaf sheaths are fine and small while the outside wall of the epidermal cells is considerably thickened and the sclerenchymatous tissue shews marked development with thickening and lignification of the cell membranes.

WHEAT 633.11

452. Tai, S. E. 633.11:575.116.1
(Linkage inheritance of certain characters in wheat).
J. Agric. Ass. China 1934 : No. 120 : 10–55.

This paper firstly gives a general review of the literature on the inheritance of beardedness, colour of kernel and colour of chaff. No literature could be found on the mode of inheritance of the degree of acuteness of the beak and the width of the shoulder of the glume. The parents were Nanking University No. 26 (bearded, brown chaff, red kernel, acute beak and narrow shouldered glume), Early Arcadian (beardless, but with awn tips, brown chaff, white kernel, and glume beak, obtuse), Honor (beardless, occasionally with awn tips; glume, light brown; white kernel; glume beak, obtuse; wide shouldered glume). The crosses were made in 1928 and the progenies were tested in the succeeding years.

In both crosses between Nanking University No. 26 x Honor and the Early Arcadian x Nanking University No. 26, red colour of the grain proved dominant with a ratio of 15 red to 1 white; thus duplicate factors were apparently responsible for this character. The ratio of the F_3 progenies agreed with the expectation.
In both crosses the beardlessness and the beardedness shewed a simple mendelian ratio which was confirmed in the F_3.
In the F_2 of Nanking University No. 26 x Honor, among 101 plants 26 shewed brown, 68 light brown and 7 white chaff, giving a ratio of 4 : 11 : 1. In F_3, 6 lines from the F_2 proved to be non-segregating and among them one was brown, one light brown and one white. Among the ten segregating lines, 4 shewed a 4 : 11 : 1 ratio (as above), 2 shewed 1 brown to 3 light brown, 2 shewed 1 brown to 2 light brown to 1 white and 2 shewed 3 light brown to 1 white. The dominant Wc_1Wc_2 were assumed to be responsible for this character. Homozygous Wc_1 produced brown chaff and heterozygous Wc_1 and either homozygous or heterozygous Wc_2 produced light brown chaff and in the absence of both white chaff was produced.
In both crosses obtuse beak of the glume was found to be monofactorially dominant over the acute beak. In F_2 of Nanking University No. 26 x Honor among the 101 plants 69 produced obtuse, and 32 acute beak, while in F_2 of Nanking University No. 26 x Early Arcadian, 95 and 29 plants respectively were obtained, i.e. a ratio of 3 : 1 in both cases.
Beardless and bearded were completely linked with obtuse and pointed beak respectively as shewn by both crosses. A simple allelomorphic pair *Aa* was assumed to be responsible for both contrasting characters.
Concerning the mode of inheritance of the width of the shoulder of the glume, among the 101 F_2 plants of Nanking University No. 26 x Honor, 63 had narrow and 38 had wide shouldered glumes, shewing a 9 : 7 ratio. The factors B_1B_2 and B_1b_2 or b_1B_2 were postulated as responsible for narrow and wide shoulders respectively. The F_3 absolutely confirmed this assumption.
The narrow and wide shoulders were linked with acute and obtuse beak. Unfortunately the crossing-over percentage could not be calculated owing to the small size of population. Evidently the narrow shoulders were evidently linked with beardedness.
Finally, the author formulated the genotypes of the parents to be
$W_1W_1W_2W_2aaWc_1Wc_1Wc_2Wc_2B_1B_1B_2B_2$ for Nanking University No. 26,
$w_1w_1w_2w_2AAwc_1wc_1Wc_2Wc_2b_1b_1b_2b_2$ for Honor, and $w_1w_1w_2w_2AA$ for Early Arcadian.

T. C. C.

453. 633.11:575.127:576.354.4

KIHARA, H. 633.11 *Aegilops*:575.127.2:576.356.5

Genomanlayse bei *Triticum* und *Aegilops* VII. Kurze Übersicht über die Ergebnisse der Jahre 1934–36. (**Genom analysis in *Triticum* and *Aegilops* VII. Brief survey of the results of the years 1934-36**).
Mem. Coll. Agric. Kyoto 1937 : No. 41 : Pp. 61.

A survey of the work on genom analysis at Kyoto with *Aegilops*, *Triticum*, *Secale* and *Haynaldia* during the years 1934, 1935 and 1936.
A list of the *Aegilops* species in the author's collection is given, with their origin and their chromosome numbers. Only in two species was variation in chromosome number found, in *Ae. triaristata* (n = 14 and 21) and in *Ae. crassa* (n = 21 and 14).
The results of the cytological analyses of the crosses studied in the three years under review are given in tables, with remarks on the points of interest. Fertilities are also given in the tables.
In 1934, regression phenomena, which might lead to the formation of restitution nuclei, were frequently observed in *Ae. cylindrica* x *Ae. speltoides*. Many hybrids of *Ae. triaristata* (6x) were studied and it was found that no *Aegilops* species has a genom or genoms completely homologous with it, though *Ae. ventricosa*, *cylindrica*, *triuncialis* and *crassa* each seem to have one genom fairly closely related to one in *triaristata*. Bivalents found in *Ae. triuncialis* x *S. cereale* are attributed to autosyndesis among the 14 *triuncialis* chromosomes.
In 1935 the 4x as well as the 6x forms of *Ae. triaristata* were used. In the hybrid between them $14^{II} + 7^{I}$ was the rule. Hybrids of *Ae. triaristata* (4x) with *Ae. ovata* and *Ae. cylindrica* indicated the presence of one related genom, possibly the C-genom, in these species. *Ae.*

caudata (n = 7) x *Ae. cylindrica* (n = 14) gave $7_{II} + 7_{I}$ and *caudata*, having no genom in common with spelt (ABD) must therefore carry the C-genom. The hybrid *Ae. ventricosa* var. *comosa* x *Ae. ventricosa* var. *fragilis* had $12_{II} + 1_{IV}$, while the reciprocal cross had $11_{II} + 1_{VI}$; it would appear therefore that the varieties differ by a single reciprocal translocation but that by chance one of the parents chosen for the latter cross had a second interchange, involving one of the chromosomes concerned in the first.

In 1936 a wide range of material was investigated. Chromosome pairing in the hybrid *Ae. Kotschyi* x *Ae. variabilis* shewed that the genoms of these tetraploid species are nearly homologous, two independent interchanges sufficing to explain the irregularities found. The species are therefore closely related, possibly varieties of one species, but are widely separated from *Ae. triuncialis*, since the hybrid *Ae. Kotschyi* x *Ae. triuncialis* was completely sterile. The hybrid *Ae. Heldreichii* x *Ae. comosa* ssp. *eu-comosa* had always $5_{II} + 1_{VI}$, indicating that the genoms of the parents differ only by a single interchange; Eig's classification of *Heldreichii* as a subspecies of *Ae. comosa* is therefore correct. Regression of the first maturation division was frequent in the hybrids *Ae. speltoides* x *umbellulata* and *biuncialis* x *longissima*. From the first hybrid two viable seeds were obtained by selfing, but the second was highly sterile. The cross *T. Timopheevi* x spelt was again studied and though the author agrees with Kostoff's findings (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 403) he prefers to use a different letter (G) to designate the second genom of *Timopheevi* in accordance with his previous usage. The different shades of meaning of the term "homology" as applied to genoms are discussed. The development of the pollen, which is essentially similar in all genera, is described. Two divisions occur in the pollen grain, so that the mature pollen before shedding contains three nuclei. Five degrees of degeneration are distinguished and their relative frequencies in the hybrids studied are given in tabular form. In pure species only *Ae. speltoides* and *Ae. Aucheri* shewed an appreciable amount (about 30 per cent) of degenerate pollen. In the hybrids the percentage of good pollen gives an indication of the seed fertility.

In the hybrid *Ae. squarrosa* x *Haynaldia villosa* giant pollen grains with 1 to 5 nuclei are produced; they are inviable. In *Ae. caudata* x *Ae. speltoides*, viable, tetraploid, giant pollen grains are produced. The hybrids *Ae. speltoides* x *caudata*, *speltoides* x *umbellulata* and *biuncialis* x *longissima* frequently produced pollen with the unreduced chromosome number. Of 6 F_2 individuals obtained from the second cross by open pollination, 4 were very big in the seedling stage and were tetraploid (2n = 28), the other two were small and had 27 somatic chromosomes.

In an appendix are given a chart shewing the hybrids which have so far been produced among the wheat relatives, excluding *Agropyrum*, and an extensive table (21 pages) giving a survey of the results relating to chromosome pairing in such hybrids.

454. KANIEWSKI, K. 633.11:575.127.2:575.11:581.46

Über neue Weizenarten erhalten durch Kreuzungen innerhalb der Emmerreihe. (**On new wheat species obtained from crosses within the emmer series**).

Acta Soc. Bot. Polon. 1936 : **13** : 171–86.

The ear, glume and spikelet characters are analysed in the progeny of crosses between *Triticum polonicum*, *T. dicoccum*, *T. durum* and the new *polonicoide* form (Cf. "Plant Breeding Abtracts", Vol. V, Abst. 310). From the results it is shewn that the considerable difference between the glume thickness of *T. dicoccum* and *T. durum* is caused by the same factor *C* as the smaller difference between the same character in the *polonicoide* form and *T. polonicum*. The *polonicoide* form and *T. dicoccum* have therefore *CC* and *T. durum* and *T. polonicum* *cc*. The *Pp* factors already described in previous papers have a modifying effect on glume thickness and length. Besides *Pp* the following factors are concerned in the formation of the ear characters:—

A a factor or group of factors which increases the length of the outer glumes.
B a factor or factors which increase the breadth of the outer glumes.
C a factor or factors which increase the basal thickness of the outer glumes.
D a factor or factors causing brittleness of the glumes.
d causing elastic glumes which cannot be removed from the spikelets without damage.

E a factor or factors causing a bending of the tooth at the top of the glume.
F a factor or factors which enlarge the keel.
G a factor for narrow ear.
H a factor for lax ear.
I a factor for club-shaped ear.
K a factor for brittle rachis.
The four wheat species used have therefore the following genetical formulae:—
T. polonicum L. *PPAAbbccDDeeFFggHHiikk*
T. dicoccum Schübl. *ppaaBBCCddEEffGGhhIIKK*
T. durum Desf. *ppAAbbccDDeeFFggHHiikk*
Polonicoide form *PPaaBBCCddEEffGGhhIIKK.*
The *polonicoide* form has been named *T. polonicoides.*

455. KIHARA, H. 633.11:575.127.2:575.11.061.633
Genetic studies on the chlorophyll defective segregates arising from interspecific hybrids I. *Triticum persicum* x *T. Timopheevi.*
Bot. Mag. Tokyo 1937 : **51** : 584–89.
Using the highly sterile hybrid *Triticum persicum* var. *stramineum* x *T. Timopheevi* it is shewn that a gene for yellow (*y*) and two for albino (a_1, a_2) are recessive to *Y*, A_1 and A_2 respectively. Only plants possessing *Y*, and either A_1 or A_2 can develop normal green coloration.
J. G. H.

456. MATSUMURA, S. 633.11:575.127.2:576.312.35:581.162.5
(The relation between chromosome number and fertility in pentaploid wheat hybrids).
Kagaku (Science), Tokyo 1936 : **6** : 337–41.
This paper summarizes the data on the relation between chromosome number and fertility in the F_2 and back-cross progenies of the pentaploid hybrid *T. polonicum* x *T. Spelta* (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 604 and Vol. VIII, Abst. 104). New data are given on the fertility of plants from the back-crosses *T. polonicum* x F_1 and *T. Spelta* x F_1. In the former the correlation between fertility and chromosome number was $-0{\cdot}4001 \pm 0{\cdot}0472$ and in the latter $0{\cdot}8424 \pm 0{\cdot}0135$.

457. YAMASHITA, K. 633.11:575.127.2:576.356.5:581.44
Genetische Untersuchungen über den Markgehalt der Weizen-Halme.
(Genetical investigations on the pith content of wheat stems).
Mem. Coll. Agric. Kyoto 1937 : No. 39 : 9–38.
The nature of the straw (hollow or solid) was investigated in the following wheats: einkorn—*T. monococcum* L. var. *vulgare* Körn. and *T. aegilopoides* Bal. var. *boeoticum* Perc. (both hollow but thick-walled); emmer—*T. dicoccum* Schübler var. *liguliforme* Körn., *T. durum* Desf. var. *Reichenbachii* Körn. (both solid throughout), *T. polonicum* L. var. *vestitum* Körn. (solid, with sometimes a small lumen in the uppermost internode, hollow in the lower internodes), *T. turgidum* L. var. *nigrobarbatum* Körn., *T. persicum* Vav. var. *fuliginosum* Zhuk. (both solid in the top 10 cms. of the uppermost internode, hollow elsewhere), *T. orientale* Perc., *T. dicoccoides* Körn. var. *Kotschyanum* Perc. (both thick-walled, hollow) and *T. persicum* Vav. var. *stramineum* Zhuk. (hollow, with a large lumen, but thicker walls than in the spelt series); *T. Timopheevi* Zhuk. (thin-walled, hollow); spelt—*T. vulgare* Host. var. *erythrospermum* Körn., *T. compactum* Host., *T. Spelta* L. var. *Duhamelianum* Körn. (all thin-walled, hollow).
The condition in the F_1 hybrids of many of these forms is described and illustrated and also the segregation observed in back-crosses of pentaploid hybrids to both parents. In the back-cross of *durum-vulgare* hybrids to *T. durum*, the proportion of hollow-strawed plants increased with the number of univalents (D genom chromosomes). All F_1 x *T. vulgare* plants had hollow straw. There is therefore a factor for hollow straw in the D genom. The single chromosome of the D genom carrying this factor was apparently present in certain trisomic derivatives of the back-cross of *polonicum-Spelta* hybrids to *T. polonicum*, for in some lines the 29-chromosome plants had hollow straw while the 28-chromosome plants had solid straw. There also

occurred in the progeny of this back-cross 28- and 29-chromosome lines in which all plants had hollow straw and it is concluded that the B genom of *T. Spelta* also carries a factor for hollow straw. Other lines of similar origin gave segregation in 3 solid : 1 hollow. It was noted that in the segregating lines a greater proportion of the solid-straw plants had a smaller lumen than in the lines breeding true for solid and this is attributed to incomplete dominance of the factor for solid straw.

Solid-straw plants with 29 chromosomes were crossed with dwarfs D–2d, D–2e, D–2g and *gigas* derivatives of D–2e and D–2f (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 143), all with hollow straw. The F_1 hybrids were hollow in all cases except in the cross with D–2e *gigas*. This is taken to shew that the ϵ chromosome (Cf. "Plant Breeding Abstracts", loc. cit.) carried a factor for solid straw.

The following factors are postulated by the author: m_A, a factor for hollow straw in the A genom (no allelomorph of this factor is known); M_d, a factor for solid straw in the B genom of *T. dicoccum* and *T. durum*; M_p, a factor for solid straw in *T. polonicum*; M_t a factor for solid straw in *T. turgidum*; m_B, m_B, and m_G', factors for hollow straw in the B genom of *T. persicum* var. *stramineum*, the B genom of the spelt series and the G genom of *T. Timopheevi*, respectively; O_D, a factor for hollow straw in the D genom of the spelt series. To explain the occurrence of pith in the lower internodes of certain *T. polonicum* hybrids and not in the parents, a factor *C* in the A genom is postulated which reacts with the factors for solid straw in the B genom to produce this effect. *T. polonicum* carries the recessive *c*.

The epistasis and dominance reactions of the different factors are given as follows: the hollow-straw factor in the A genom is hypostatic to the *M* factors; the hollow-straw factor of the G genom of *T. Timopheevi* gives intermediate heterozygotes with *M* factors; the *M* factors are incompletely dominant over m_B'; O_D is epistatic to the *M* factors.

The genotypes and phenotypes of the different forms and hybrids studied are given in tabular form.

458. Buchinger, A. 633.11:575.127.5:633.14

Neue Ergebnisse nach Bastardierung zwischen Weizen und Roggen. (**New results from hybridization between wheat and rye**).

Züchter 1937 : **9** : 152–57.

The author describes briefly the results of other workers on wheat-rye hybridization and goes on to describe an entirely new type of result obtained by him.

A spelt wheat (*T. Spelta*) was pollinated by rye with the usual precautions. The set of seed was good, 78·47 per cent, and the seeds themselves were only half the weight of non-hybrid seed of the same parent. The F_1 plants however were identical with the female parent and fully fertile. The only character in which any difference was observed was the suction pressure of the seedlings. In the F_2 there was segregation into different ear types such as awned and awnless, lax and dense, long and short and so on. There was a segregation into 1 *vulgare* type : 2 *Spelta* type : 1 *compactum* type of ear. The F_2 ear types proved constant in the next generation.

In a repetition of the same cross, a sterile intermediate F_1 of the usual kind was obtained. No explanation of the peculiar results is offered.

459. Kattermann, G. 633.11:575.127.5:633.14:576.354.4:581.44:575.061.5

Zur Cytologie halmbehaarter Stämme aus Weizenroggenbastardierung. (**On the cytology of strains with pubescent stems from wheat-rye hybridization**).

Züchter 1937 : **9** : 196–99.

In a recently published work (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 109) the author has shewn that the character for pubescent stem is carried in the progeny of wheat-rye hybrids by the univalent or bivalent *B* chromosomes. In a paper now in the press, the author shews that these *B* chromosomes are rye chromosomes.

The occurrence of speltoids with pubescent stems is to be examined in detail on a later occasion. In the meantime the following results are published.

Two speltoid plants are described, with 43 and 42 chromosomes respectively.

In the first plant the formation of multivalents led to considerable variation in the arrangement of the chromosomes. The *B* chromosome only once occurred unpaired.
The chiasmata of the *B* bivalent were particularly studied. There was a marked preponderance of rings. Six different types of the *B* bivalent were noted; double rods with terminal, sub-terminal and sub-terminal + terminal chiasma, rings, always terminalized on one side, on the other as in the double rods. As a rule the *B* bivalent was easily recognizable.
In the second plant with 42 chromosomes meiosis was as regular as in a pure wheat species and the progeny was very uniform. In this plant also ring forms of the *B* bivalent preponderated and five types were observed. In view of this behaviour of the rye bivalent in the wheat genom the author briefly discusses the possibility of the incorporation of foreign chromosomes into the genom as a factor in the evolution of the genus *Triticum*.

460. Papadakis, J. S. 633.11:575.41
(Does natural selection operate only according to yield of grain in cultivated plants ?)
Bull. Sci. Inst. Amélior. Plantes Salonique 1937 : No. 26 : Pp. 29.
Experiments were made during the three years 1933–36 with three different mixtures of varieties of wheat, taking equal numbers of grains. These were sown in a number of different plots on the same experimental ground. Statistical methods were used for the estimation of the yields. The yield of the mixtures was always less than that of a pure variety.
The yield of each of the varieties was separately determined and the results shewed that a high yield constitutes an important factor in the struggle for existence. It is not, however, the only or the most important factor; some varieties appear to be more aggressive than others. This character of aggressiveness is held to be a complex of several elementary physiological characters.
Natural selection does not therefore necessarily lead to the production of the most high-yielding forms and artificial selection must be employed.

461. Bonvicini, M. 633.11:575.42
Selezione genealogica del grano "Solina". **(Genealogical selection of the wheat "Solina").**
Inst. Allevamento Veg. Cerealicolt. Bologna 1936 : Pp. 14.
The "Solina" variety of wheat, a much cultivated variety, shewed numerous variations. From 53 strains specially grown, types were selected shewing differences in time of earing, height of the plant, vigour of the stems, resistance to rust, and colour and density of the ear. Selection among these finally produced two strains both resistant to rust and higher yielding than the original variety.

462. 633.11:575.42(47)
Kravchenko, Y. 633.11 Hordeiforme 273
(A new variety of spring *durum* wheat).
Bull. Appl. Bot. Leningrad 1937 : Ser. A (21) : 29–30.
On the history and performance of the new variety Hordeiforme 273 which was obtained by selection from lines derived from a sample of spring forms of *T. durum*. In 1934 and 1935, Hordeiforme 273 gave yields of 12·49–14·54 centners per hectare. It has also shewn a certain amount of resistance to stem rust, loose smut and *Septoria*. The grain is amber coloured and suitable for milling and macaroni purposes. The variety is being multiplied for seed.

463. Bonvicini, M. 633.11:581.162.32:575
Un incrocio spontaneo fra grani duri. **(A natural cross between hard wheats).**
Inst. Allevamento Veg. Cerealicolt. Bologna 1935 : Pp. 20.
As natural crossing between hard wheats (*Triticum durum*), appears to be considerably less frequent than between soft wheats (*T. vulgare*), the progeny of a natural cross of *T. durum* which must have occurred in 1928 is described in some detail.

There was considerable variation in a number of characters and some new characters were observed which occurred neither in the maternal parent nor in the probable paternal parent. By 1933 a few lines had been fixed which promised improvement over the original variety in earliness, height, strength of the halms, resistance to rust and in shape and size of the ear. (Cf. "Plant Breeding Abstracts", Vol. IV, Abst. 124).

464. 633.11:581.192:575.22:576.16
KNYAGINICHEV, M. I. 633.11:575
(Variability in protein content and its importance for wheat breeding).
Bull. Appl. Bot. Leningrad 1937 : Ser. A (21) : 5–28.

A more elaborate and speculative discussion of the findings already reviewed in "Plant Breeding Abstracts", Vol. VIII, Absts. 92 and 116, variation in protein content being considered from the ecological, geographical, varietal and morphological standpoints.

In selecting parents for crossing to obtain wheats of superior quality as regards protein content, forms should be chosen containing a high amount of protein; and one parent should have a long ear to ensure uniformity in the size of the grains and in protein content of the ear; the second parent should have a more compact ear and relatively little variation in protein content in the individual grains as well as uniform grain in the individual ears of the plants. Suitability to ecological conditions of the region in question should also be considered. Selection from among the segregates of forms combining high protein content with high yield should result in the desired type.

A very limited number of forms should be taken as initial material, which should be studied in detail and with due regard to agronomic conditions and the reactions of the plants to such factors as manuring, etc.

Uniform conditions should be ensured in nursery plots and control established by comparison with two varieties differing in their relation to the existing soil conditions.

Differences of 1–2 per cent increase in protein content should be aimed at by the breeder.

Various speculations are put forward to explain the different types of variation in protein content. The most useful forms for breeding purposes will be those with the smallest range of variation in protein content and wheats with not more than two grains per spikelet but with uniform development of the ears are recommended.

465. MELNIKOV, A. N. 633.11:581.48:576.16:578.081
(Structure of the seed coat of Abyssinian *durum* wheats).
Bull. Appl. Bot. Leningrad 1937 : Ser. A (21) : 63–66.

Certain features in the structure of the seed which have hitherto been regarded as distinguishing *durum* and soft wheats are no longer valid as criteria for Abyssinian *durum* types. But such Abyssinian forms have characteristic peculiarities in the structure of their pericarp and endosperm, the anatomy of which is fully discussed.

466. NISSEN, O. 633.11:581.49:581.481:576.356.5
Spalteåpringenes störrelse hos tvillingplanter med ulike kromosomtall.
(The size of the stomata in twin plants with different chromosome numbers).
Bot. Notiser 1937 : 28–34.

Investigations were made on the differences in size of the stomata of the leaves of twin plants with different chromosome numbers. The following plants were used.

Poa pratensis L., in 5 pairs of twins of which one of each was triploid and as control one pair with the same chromosome number. *Phleum pratense* L., in 3 pairs of which one was triploid and in one pair of which one was haploid. *Dactylis glomerata* L., in 1 pair of which one was haploid and *Triticum vulgare* in 1 pair of which one was triploid.

The results shewed that there is little variation in size between adjacent stomata on the same leaf but between different leaves there is considerable variation.

Of the 11 pairs differing in chromosome number the plants with the higher chromosome number always had the larger stomata and the difference was statistically significant in 10 of the pairs

in which 10 leaves per plant were measured but not for the wheat pair in which only the measurements of five leaves are recorded. The degree of variation was, in general, greatest in the plants with the highest chromosome numbers.

467. 633.11:581.9(51)
633.11:576.16
Hosono, S.
(Distribution and spread of wheat in China).
Kagaku (Science), Tokyo **1934** : **4** : 509–12.

From specimens of wheat seed obtained in China the author concludes that that country has more varieties than Japan. Of the four species found in China, *Triticum vulgare*, *T. compactum*, *T. durum* and *T. turgidum*, the first is very widely distributed. If the writer's subdivision of the section *Inflatum* into two groups, *Aristoinflatum*, Hosono and *Mutsinflatum*, Hosono, be adopted, China must be accorded 26 varieties instead of 18, the number originally known.

China may be regarded as a secondary centre of origin for the varieties with inflated-curved awns.

T. dicoccum is rarely found.

468. Gescher, N. v. 633.11–1.524:575
The international character of wheat and the diffusion of the different varieties of wheat throughout the world.
Int. Rev. Agric. **1937** : **28** : T329–48.

The author traces in some detail the process of exchange of wheat varieties between the different wheat-growing countries of the world, either as direct introductions or as material for breeding. The importance of this process in the improvement of wheat is emphasized. The tendency in the present day to turn to the centres of origin for breeding material is pointed out and also the wide importance of certain varieties like Red Fife, which have been used in the breeding of successful wheats almost everywhere.

469. 633.11–1.524.2:575.12(47)
(Notes).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) **1937** : No. **3** : p. **43**.

Tests made in the U.S.S.R. with wheats from China and other countries have demonstrated the great value of the Chinese forms as regards resistance to brown rust and drought, rapidity of development of the grain, tillering capacity and the cultivated type of the ear and the grain. All the main plant breeding stations of the U.S.S.R. have now been supplied with Chinese wheats for use in hybridization.

470. 633.11–2.111–1.521.6:575.42
633.1:575.148:575.12
Timofeeva, M.
(Selection and intravarietal crossing as a means of increasing winter-hardiness of winter wheats).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) **1937** : No. **3** : 192–95.

The validity of Lysenko's views on the advantage to be derived from selection and crossing within "pure lines" (i.e. varieties) was demonstrated by a study of frost resistance in inbred lines and populations of the winter rye Vjaka, and in wheat plants raised from intra-racial crosses. The resistance of the inbred rye plants was far below that of the controls, their tillering was poor and the grains small. The wheat plants in F_1 and F_2 on the other hand, shewed markedly greater frost resistance as compared with the controls and were also superior in uniformity, height, size of ears, earing and tillering capacity.

A study of a collection of varieties of wheat shewed wide differences in the hardening potentiality of plants within the individual varieties—a range of from—12 to — 21° C. being recorded as the lethal temperatures for most of the varieties. The basis of such wide differences in resistance may be partly determined by the available supply of labile substances in the

grains and plants but mainly by a longer vernalization stage and a superior adaptation for development and maintenance of hardening potentiality.
In certain cases the intravarietal differences in the frost resistance of winter wheat even exceeded those found between varieties.
In selection, biological characters such as hardening potentiality should be considered in addition to morphological features.

471. Briginets, N. 633.11–2.111–1.521.6:581.44:581.03
(Increasing the winterhardiness of winter wheat by inducing formation of the tillering node at a low level).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) 1937 : No. 7 : 178–89.
The tillering node has been proved to be the most cold resistant part of winter wheat plants. In spite of Pereturin's data, the author found no correlation between cold resistance in varieties and depth below the soil of the site of development of the tillering node. Node formation at a suitable depth may be induced by soaking the seed in water and subsequent illumination of the sprouts for various periods before sowing.

472. 633.11–2.112–1.521.6:575.42
Stefanovsky, I. A. 581.143.26.03:633.11
(The drought resistance of wheats of different geographical origin).
Bull. Appl. Bot. Leningrad 1937 : Ser. V–A (3) : Pp. 80.
Some indigenous Russian wheats and three hundred varieties from the world collection were tested for drought resistance under field conditions in the Lower Volga Region and in Central Asia, decrease in yield and thousand corn weight being used as an index of the relative resistance of the varieties. At the same time observations were collected regarding the influence of irrigated or rainfed cultivation upon drought resistance and vegetation period, and regarding vernalization and its relation to drought resistance, yield, and length of vegetation period. Other physiological factors such as wilting, opening of the stomata, root system development, high temperature action at various stages of plant growth are also considered. In the second half of the pamphlet various groups are established for the material tested and a short supplementary list is given of the most valuable varieties in the experimental material from the standpoint of different economic characters.
For breeding purposes the use of certain standard varieties from northern Europe is recommended for earliness, and varieties from Canada, U.S.S.R., Tunis and Cyprus for gluten quality. The most drought resistant wheats were found in the U.S.S.R., Afghanistan, Cyprus, Palestine, Asia Minor, India and Australia, etc.; these forms may be used in selection and subsequent breeding work. Variety trials for drought resistance should be made with vernalized and non-vernalized material as an aid in the selection of suitable parents for crossing.

473. Pukhalsky, A. V. 633.11–2.42–1.521.6:575(47)
(Damage caused to winter wheat and rye by the fungus "*Sclerotinia*").
Bull. Appl. Bot. Leningrad 1937 : Ser. A (21) : 53–61.
Though tests of large numbers of varieties from the world collection of wheats revealed no varieties completely immune to *Sclerotinia graminearum*, forms from Finland, Sweden, Denmark, Holland, Switzerland and U.S.A. as well as local Russian types from the north-eastern regions of the northern non-black soil zone should, it is believed, be useful as breeding material.

474. 633.11–2.452–1.521.6:575.116.1
NIGGEMANN, W. 633.11–2.183–1.521.6:578.081
Methoden zur Messung der Standfestigkeit und ihre Anwendung zur Bestimmung der Faktorenkopplung mit Gelbrostverhalten in verschiedenen Weizenkreuzungen. (**Methods for the measurement of standing capacity and their application to the determination of factor linkage with the reaction to yellow rust in different wheat crosses**).
Kühn-Arch. 1937 : **44** : 55–82.

The method of estimating standing capacity evolved by Pech (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 139) was modified to make it suitable for testing small progenies. The original method was based on the lifting of a glass plate by a group of growing seedlings, the author's on the breaking down of the seedlings under a load applied to the plate, in this case an aluminium plate. The results obtained by this method for different varieties agreed well with those obtained in the field over a series of years.

The F_3 and F_4 of the crosses Ridit x General von Stocken and Ridit x Peragis were studied to find whether there was any linkage between resistance to *Puccinia glumarum* and standing capacity. Ridit is an American winter wheat with field resistance to *P. glumarum* but is susceptible to lodging; General von Stocken is a German winter wheat of medium to good standing capacity but susceptible to most biotypes of *P. glumarum*; Peragis is a spring wheat with good standing capacity and marked susceptibility to yellow rust. Combining the O-type plants with the susceptibles, ratios of 3·13 rust resistant : 1 susceptible in the F_3 of the first one and of 3·02 : 1 in the second of the above two crosses were obtained. Comparing these to a ratio of 3·9 : 1 the author concludes that resistance is dominant and determined by two factors. The standing capacity of single plant progenies was determined by the new method and transgressive segregation in both directions was observed. The distribution approximated to the normal frequency distribution, indicating that multiple factors are involved. The similarity of the distributions of standing capacities within the three groups giving resistant, O-type and susceptible reactions to rust indicated that there was no linkage between these two important economic factors. The physiological form of rust involved was mainly race 19, artificially increased in the test plots, but naturally occurring forms were also present.

475. STEFANOVSKY, I. A. 633.11–2.452–1.521.6:581.02(47)
(**Resistance of wheat to brown rust under conditions in the Trans-Volga region**).
Bull. Appl. Bot. Leningrad 1937 : Ser. A (21) : 43–52.

A collection of 370 wheats of different species and varieties from the world collection was used in determining the effects of environmental factors such as irrigation, time of sowing and vernalization, upon immunity to *Puccinia triticina*. Though such external factors did affect immunity, certain hard wheats from Cyprus, Tunis, Palestine, etc. retain their resistance under varying conditions and should be of value in breeding.

476. KARGAPOLOVA, N. N. 633.11–2.452–1.521.6:581.192:575
(**The chemical peculiarities of wheat in connexion with their resistance to rust**).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (11) : 179–99.

An attempt was made to ascertain what chemical compounds toxic to parasites and to *P. triticina* in particular are to be found in resistant species and varieties of wheat and whether they could be used to diagnose resistance. In view of the findings of earlier investigators, attention was concentrated upon the possible role of the phenol compounds and their derivatives in a study of the leaves of wheat at the seedling and milk ripe stages.

The test material was composed of species and varieties differing widely in resistance to *P. triticina* and the immune and resistant forms were found to have a high content of phenolic compounds in the acetic ethyl fraction and a positive correlation was recorded between the content of these compounds and differences in resistance.

No correlation was noted between the peroxydase activity, the *p*H of the cell sap and resistance.
Further tests shewed that, as compared with that of susceptible types, the acetic ethyl fraction of resistant types was highly toxic to spores of *P. triticina.*

477. 633.11–2.452–1.521.6:664.641.016
WHITESIDE, A. G. O. 633.11:575.127.2
The quality of rust-resistant hard red spring wheat under development in Canada.
Cereal Chem. 1937 : **14** : 674–82.
Data are given on the milling and baking quality of the new rust-resistant wheats Apex, Renown and Thatcher which carry the mature plant resistance of tetraploid wheats such as Iumillo and Vernal Emmer.

478. RADULESCU, E. 633.11–2.7–1.521.6
Ueber die Kornkäferanfälligkeit verschiedener Weizensorten. (**On the susceptibility of different varieties of wheat to the grain weevil**).
Z. ges. Getreidew. 1937 : **24** : 211–12.
Experiments shewed that the resistance of varieties of wheat to the grain weevil *Calandra granaria* L. was connected with the composition of the grain. In general the varieties with vitreous grain are more resistant than those with mealy grains. The results also shewed that the resistant forms were richer in gluten than the susceptible ones.

479. CHESNOKOV, P. G. 633.11–2.7–1.521.6:575
[**Resistance of spring wheat to the frit fly (*Oscinella frit* L.)**]
Bull. Appl. Bot. Leningrad 1937 : Ser. II (11) : 153–78.
This paper deals mainly with the findings that have been recorded by various investigators on the problem of frit fly resistance. A piece of original research by the author, in which 400 forms of wheat were tested, revealed no immune types and doubt is expressed as to whether such exist, though forms relatively resistant (and at the two periods when the first and second generations of the fly appear) were found among Russian wheats belonging to *Triticum dicoccum rufum* and *T. Timopheevi.* The most valuable types economically would be those which suffer relatively little from infestation by the first generation, which does most damage to the plant just when tillering is beginning.
The relation between the susceptibility of different varieties and their systematic position or their geographical origin is examined and the available data tend to confirm Flaksberger's view that the inherent biological characters of a variety operating in the particular environment of its origin is a more important factor in resistance than is its systematic position.
The factors conditioning infestation differ in different varieties and a study of the relation between the morphological structure of different types of wheat and their susceptibility should be of interest.
Relatively little work has been done on the various resistance factors, both environmental and varietal, such as physiological tolerance to drought, frost, etc., earliness and tillering capacity and no conclusions can be drawn as to the greater resistance of the soft wheats in general as compared with the hard forms; but it is admitted that, especially in the early stages of development, definite differences in susceptibility are found among different forms of wheat; and no doubt comparatively resistant forms could be obtained by selection.
Results are cited which suggest that a connexion exists between the susceptibility of certain varieties and the closeness of their mutual relationship; and, though frit fly resistance may not be a definite hereditary character, it should be given due consideration in breeding operations. Moreover in the selection of parent forms, physiological factors such as rate of development, tillering capacity, rapidity of stem formation, etc. should receive attention in view of their importance in regard to injury caused by infestation and to resistance to the pest.
A table of host plants of the frit fly and a bibliography conclude the paper.

480. 633.11.00.14(43.6)
MAYR, E. 633.14.00.14(43.6)
Die österreichischen Weizen- und Roggen-Zuchtsorten. (**The Austrian wheat and rye varieties**).
Züchter 1937 : **9** : 146–52.
The substance of the part about wheat has already been reviewed (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 966).
Descriptions are also given of 16 rye varieties from the identification tests.

481. 633.11 *Aegilops*:575.127.2:576.354.4
BERG, K. H. v. 633.11 *Aegilops*:575.127.5:633.289
Beitrag zur Genomanalyse in der Getreidegruppe. (**Contribution to genom analysis in the cereal group**).
Züchter 1937 : **9** : 157–63.
Meiosis in the pollen mother cells of the following F_1 hybrids is described: *Aegilops umbellulata* (n = 7) x *Haynaldia villosa* (n = 7), *Ae. umbellulata* x *Ae. uniaristata* (n — 7), *Ae. variabilis* (n = 14) x *Ae. umbellulata*.
The hybrid *Ae. umbellulata* x *H. villosa* was completely sterile. No pairing whatever was observed at the first division of meiosis and in the absence of a metaphase plate, extreme stretching of the spindle occurred. The equational split appeared in the univalents at the first division, but only rarely did the halves separate at this stage. The random distribution of the univalents gave rise to major and minor nuclei and occasionally to a restitution nucleus.
In *Ae. umbellulata* x *Ae. uniaristata* from one to six bivalents were observed, most frequently three to five. They were usually rod-shaped, but occasional ring bivalents were seen. Trivalents occurred fairly frequently and only one quadrivalent was found in 100 cells.
The hybrid *Ae. variabilis* x *Ae. umbellulata* shewed in 67 out of 70 pollen mother cells $7_{II} - 7_{I}$. In two cells $1_{III} + 6_{II} + 6_{I}$ and in another $8_{II} + 5_{I}$ appeared. The chiasma frequency per bivalent was 2·12.
The results confirm the distant relationship of *Haynaldia* to the other genera of the cereal group, indicate a semi-homologous relationship between the genoms of *Ae. umbellulata* and *uniaristata* and shew that the genom of *Ae. umbellulata* is closely, if not completely, homologous with one of the two genoms of *Ae. variabilis*. The author suggests that the genom these two species have in common is the C genom, which has been shewn to be a sort of "basic genom" in the section *Pleionathera*, to which both species belong.

OATS 633.13

482. SAULI, J. O. 633.13:575(47.1)
Die finnischen Landhafer. (**Finnish land oats**).
Suom. Maataloust. Seur. Julk. 1937 : No. 34 : 92–99.
Before the beginning of the 20th century when the first specially bred varieties began to be distributed, the old land varieties were mainly cultivated.
The morphological and agronomic characters of these land races are described in detail. The most important of these characters is the short vegetative period. The good tillering of the oats is an important factor in resistance to frit-fly. Selection among the land races has failed to produce any strains equal to those experimentally bred. This is attributed to the lack of certain hereditary factors, such as those controlling grain quality and standing capacity but, on the other hand, the land races possess factors lacking in the foreign varieties.
Good results are to be expected from crossing the land races with foreign varieties as this leads to a combination of different polymeric factors and to transgression among the progeny.

483. COFFMAN, F. A. 633.13:581.162.32:578.08
Factors influencing seed set in oat crossing.
J. Hered. 1937 : **28** : 297–303.
The author's method of emasculation and pollination is described. The best results are obtained when the maximum temperature is not too high, the humidity not too low and the time between 2 p.m. and 5 p.m.

484. Murphy, H. C., Stanton, T. R. and Stevens, H. 633.13–2–1.521.6:575
Breeding winter oats resistant to crown rust, smut, and cold.
J. Amer. Soc. Agron. 1937 : **29** : 622–37.

An account is given of the results up to the sixth generation of an experiment in the breeding of cold, smut and crown rust resistant winter oats from the crosses Lee x Victoria and Hairy Culberson x Victoria.

Out of 600 F_2 seedlings 47 had a prostrate habit of growth and seed from these collected for the F_3 generations, was tested for reaction to cold by artificial freezing tests, and to crown rust (*Puccinia coronata*). Further tests for cold and crown rust resistance were performed in later generations and also tests of reaction to smut (*Ustilago avenae*). Only one physiological race of each fungus was used in the tests.

In the Lee x Victoria cross, but not in the other, there was evidence in the F_3 and later generations of transgressive segregation for cold resistance, some lines being more resistant than Lee, the hardier parent. The segregation for crown rust resistance was apparently based on one factor.

In the later generations it was found that many lines combined resistance to smut and to crown rust and moreover some of them carry the cold resistance of the hardy parents, Lee and Hairy Culberson. Those with promising grain characters are being tested further.

The authors suggest that the use of freezing tests is likely to accelerate the work of breeding for cold resistance. They obtained good agreement in tests for crown rust resistance based in one case on seedling reaction and in another on adult plants.

485. 633.13–2.451.2–1.521.6:575
Murphy, H. C. 633.13–2.452–1.521.6:575
Crown rust and smut resistant oat varieties.
Plant Dis. Reporter 1937 : **21** : p. 200 (mimeographed).

It is mentioned that very promising resistant hybrid selections have been obtained by crossing the resistant varieties Victoria and Bond with the local well-adapted, high-yielding varieties. Victoria has been completely resistant to smut (*Ustilago* spp.) while Bond appears to be slightly susceptible to certain of the Red Rustproof strains of smut.

Both the Victoria and Bond types of resistance to crown rust were affording ample protection in 1937.

RYE 633.14

486. 633.14:575.127.5:633.11:576.354.4
Nakajima, G. 633.14:576.356.4
(Cytological studies on the hybrid between *Triticum turgidum* (n = 14) and *Secale cereale* (n = 9).
Jap. J. Genet. 1937 : **13** : 177–84.

A plant of rye was found to have nine haploid chromosomes instead of the usual seven. Plants raised from it by open pollination had 7, 8 and 9 haploid chromosomes.

Using the 9-chromosome rye plant as pollen parent, a cross was made with *Triticum turgidum* (n = 14), one F_1 individual being obtained, which was found to have 23 chromosomes in root-tip cells. At meiosis 0–5 bivalents and 23–13 univalents were found. One small bivalent occasionally observed is probably formed by autosyndesis of the two extra rye chromosomes. The course of the division was irregular and at the tetrad stage 3–6 cells were found, with one or more micro-nuclei.

In one pollen mother cell there were found 9 bivalents and 14 univalents. This is attributed to a doubling of the 9 rye chromosomes, which may have occurred in an archesporial cell.

487. Kuckuck, H. 633.14:576.16
Zur Entstehung und Abstammung des Roggens. **(The origin and derivation of rye).**
Z. ges. Getreidew. 1937 : **24** : 131–32.

The origin of rye is traced from the weed rye growing among wheat. As a result of its greater resistance to cold it gradually replaces the wheat until at altitudes of 2,500 m. in Turkestan

the fields are all of rye. Rye moved northwards from Asia Minor, probably through southern Russia and then westwards to Germany. The weed rye of Asia Minor was already a cultivated form and differs from the wild rye in not possessing a brittle rachis. Its wild progenitor was probably *Secale montanum*, and intermediate forms have been found which have a brittle rachis but are annual.
Although rye was introduced into north-western Europe by a process of natural selection the cultivated form is the outcome of artificial selection.

MAIZE 633.15

488. 633.15:575(73)
635.67:575(73)
ROTHGEB, R. G.
Sweet corn trials in Maryland.
Rep. Md Agric. Soc. 1935 : **20** : 293–99.
Among the new varieties and hybrids mentioned are Hopeland, a white sweet corn variety recovered from a sweet-dent cross and Honey June and Sure Cropper Sugar, two varieties which were bred in Texas by crossing big late field maize with sweet corn and which are resistant to worm by virtue of their long, tough, tight-fitting husks.

489. TAVČAR, A. 635.15:575.125:581.43:631.557
Heteroza korijenja mladih kukuruznih biljaka i prirod zrna F_1 generacije. (**Heterosis of the roots of young maize plants and the yield of grain of the F_1 generation**).
Arhiv Minist. Poljoprivrede Beograd 1937 : **4** : No. 6 : Pp. 19.
On the basis of quantity of root, of the parental strains and the F_1 the results were divided into three groups; those with a greater quantity of root than the parents, those more or less intermediate and those with about the same amount. In 12 of the 31 F_1 plants heterosis of the roots was observed, 10 were intermediate and 9 had the same amount of root as the parents. The F_1 had more and longer roots than the parents and the area of root covered with root hairs, was, on the average, greater. The results of field experiments shewed that the F_1 surpassed the parents in height as well as in yield of grain per plant.
The results shew that the amount of root development and the total quantity of roots of young maize plants are relatively fairly good criteria for the selection of the higher yielding heterosis plants of the F_1 generation.
Plants of four weeks old can be used for this estimation.

490. COOPER, D. C. 633.15:575.127.5:581.33
Macrosporogenesis and embryo-sac development in *Euchlaena mexicana* and *Zea mays*.
J. Agric. Res. 1937 : **55** : 539–51.
Ovule, megaspore and embryo-sac development are essentially similar in annual Florida teosinte, yellow dent maize and in their hybrid. Four megaspores are produced, of which the chalazal one becomes the embryo-sac mother cell.

491. BENL, G. 633.15:575.183
Vererbungsversuche mit Mais. (**Inheritance experiments with maize**).
Biologe 1937 : **6** : 155–56.
An explanation of xenia in maize, with reference to its implications in the teaching of genetics.

492. CORBERI, E. 633.15:581.162.3
Contributo alla conoscenza della fecondazione selettiva del granoturco. (**A contribution to the knowledge of selective pollination in maize**).
Ital. Agric. 1937 : **74** : 577–84.
Data from experiments in which races pure for red and white grain colour were grown and pollinated with equal quantities of pollen from the red and white plants, shewed that in 70 out of the 106 mixed pollinations there was a preference for auto-pollination. It was clear from the results that some varieties have a greater tendency towards auto-pollination than others. This work is regarded as merely preliminary and further experiments both with maize and other plants are contemplated.

493. Jones, D. F. 633.15:581.48:575.25
Somatic segregation and its relation to atypical growth.
Genetics 1937 : **22** : 484–522.

An extensive account is given of the mosaics produced in the aleurone and endosperm and in the pericarp of maize grains, involving colour and texture. Paired changes, in which a loss is accompanied by a gain in an adjacent area, were found to be frequent, though less frequent than simple losses. The frequency and variety of the mosaics were increased by X-ray treatment shortly after fertilization. Linked genes may be affected together or separately. The dark part of a paired aleurone colour mosaic may revert to normal, to colourless or may become still darker; tissues which have lost one or more genes shew frequent losses of other genes in later cell generations. The frequency of mosaics varies widely in different families and from one generation to the next.

The author shews that incomplete fertilization, mutation, non-disjunction and deletion are inadequate to account for all the observed facts. The evidence indicates that interchange of genetic material occurs between homologous as well as non-homologous chromosomes.

Changes of cell size and cell arrangement are found both alone and in combination with changes in colour and texture. The author advances a theory of atypical growth according to which it is due to changes in the distribution of growth-regulating substances brought about by unequal mitosis.

494. Blaringhem, L. 633.15:581.481:575.31
Origines et destinée du mais à graines multiples (*Zea mays*, var. *polysperma*). Contribution à l'hérédité des caractères acquis. (**The origin and future of maize with multiple grains, *Z. mays* var. *polysperma*. A contribution to the inheritance of acquired characters**).
Ann. Sci. Nat. (10e Sér. Botanique) 1937 : **19** : 33–42.

For a number of years the author has grown strains of maize with multiple grains derived in the first place from *Z. mays pensylvanica* Bonafous.

Inter-crossing and selection for the abnormality has resulted each year in a varying number of plants exhibiting the character. In a discussion as to the cause of the abnormality the author suggests that the changes in the environment may cause a change in equilibrium or a rearrangement of the material at the disposal of the plant and that this rearrangement is subsequently inherited.

495. 633.15:581.6:575.12.061.5
Doxtator, C. W. 635.67:581.6:575.12.061.5
Studies of quality in canning corn.
J. Amer. Soc. Agron. 1937 : **29** : 735–53.

Extensive data relating to tenderness, obtained by a puncture test, are given for inbred lines of Golden Bantam sweet corn and their F_1 hybrids. *Inter alia* it was found that lines shewing low puncture indices tended to give hybrids having low puncture indices. The correlation coefficient between the puncture index of a cross and the average of all other crosses of the same parents was + 0·720.

496. Kozubenko, V. E. and
Račenko, I. A. 633.15–2.112–1.521.6
(**Varieties of maize under conditions of drought**).
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1937 : No. 3 : 44–49.

Maize will stand drought if it only occurs in the first half of the summer. The great reduction in yield following drought in the second half of this season can be obviated to some extent by planting early ripening varieties that are also inherently productive.

Disturbances in pollination due to a discrepancy between the time of flowering of the male and female inflorescences and also reduction in the absolute weight of the grains are mainly responsible for low yields in times of drought. The relation between drought and lodging and disease is also mentioned.

Dent maize appears to suffer least from drought and sweet maize most, possibly owing to its relatively greater tillering capacity. Specimens from Central Asia (e.g. "White Flint No. 650" from Uzbekistan) proved highly drought resistant.

497. Boewe, G. H. 633.15–2.4–1.521.6:581.46
The relation of ear rot prevalence in Illinois corn fields to ear coverage by husks.
Plant Dis. Reporter 1936 : **20** : 165–72. (Mimeographed).
A predominance of imperfectly covered ears lead to a prevalence of ear rots caused by various fungi. If the capacity of the husks to cover the ears is a heritable character, combining it with genetic resistance to certain diseases in high yielding varieties should result in greatly reduced loss from ear rots.

498. McNew, G. L. 633.15–2.482–1.521.6:575.11
Crown infection of corn by *Diplodia zeae*.
Res. Bull. Ia Agric. Exp. Sta. 1937 : No. 216 : 191–222.
Inter alia it is mentioned that selfed lines of maize differed in percentage infection. In some lines the rows from different ears gave about the same percentage infection, while in others segregation was observed.

BARLEY 633.16

499. Bulavas, J. 633.16:575.11.061.5:581.46
Miežiai švelniais akuotais. (**Smooth awned barley**).
Žemės Ūkio Akad. Metraštis 1937 : **11** : 120–41.
On account of their greater economic value, smooth-awned barleys have been bred at the Dotnuva Experimental Station for nine years.
Naturally occurring smooth-awned barleys are described, their hybrid origin is confirmed and the presence of recessive factors for smooth awns in varieties of rough-awned barleys is demonstrated. From crosses between *Hordeum vulgare* var. *leiorrhynchum* Körn. and the standard varieties Auksiniai and Gulbės kaklas and Heines four-rowed two new strains were found among the F_2 progeny, (1) two-rowed with white, dense ears and smooth awns and (2) two-rowed with black, dense ears and smooth awns. These lines gave satisfactory results in variety tests and compare favourably with the best-known varieties.

500. Heinisch, O. 633.16:575.242.061.6.633
Beobachtungen an einer Chlorophyllmutante einer zweizeiligen Sommergerste. (**Observations on a chlorophyll mutant of a two-rowed spring barley**).
Züchter 1937 : **9** : 163–69.
An albino mutant appearing in a pure line of barley gave at its first appearance a good fit to the ratio 3 green : 1 white. In the next generation, produced from the mixed seeds of the green plants, there was a marked deficiency of white plants.
In a later generation the progenies of heterozygous plants were grown separately and it was found that though the majority gave 3 : 1 ratios, in some cases strongly deviating ratios were obtained such as 76 : 1 and 50 : 1. The deficiency of white plants in the preceding generation is attributed chiefly to such deviations, though it is possible that reduced viability of heterozygotes also played a part.
No explanation is offered of the deviating ratios.

501. 633.16:576.16
633.16.0014:663.421
Tweede jaarboekje van het Nationaal Comite voor brouwgerst (Nacobraouw) 1937. (**Second year book of the National Committee for malting barley, 1937**).
Inst. Plantenveredeling, Wageningen 1937 : Pp. 83.
This year book opens with a review of barley cultivation in various countries and of the historical development of the varieties of the present day, special reference being made to the work of Vavilov and Orlov in the U.S.S.R.

Statistics of barley cultivation and the results of variety trials in Holland from 1932–36 are discussed, with notes on the suitability of varieties such as Kenia, Maja, Saxonia, etc. for malting purposes.
The relation between climatic conditions and the malting quality of barley and the baking quality of wheat is also discussed and the requirements for good malting barley are set out with advice to growers, malters and brewers.

502. Friedberg, L. and Bergal, P. 633.16:581.142
Maturité commerciale et maturité physiologique des différentes variétés d'orges. (**Commercial and physiological maturity of different varieties of barley**).
Sélectionneur 1937 : **6** : Fasc. **1** : 16–26.
Tests of the germination capacity of varieties of barley immediately and at intervals of 5, 15, 30 and 90 days after harvesting shewed that considerable differences exist among varieties. The majority of malting barleys shewed a normal rate of germination 30 days after harvest. Of the other kinds, some germinated perfectly immediately after harvest, others shewed a very poor germination capacity even three months later and between these two extremes there was a continuous series.

503. Massenbach, H. F. v. 633.16:581.192.2:575
Unterlagen für die Züchtung eiweissreicher Gersten. (**Foundations for the breeding of high-protein barleys**).
Z. Zücht. 1937 : A **21** : 423–50.
The effect of environmental factors on the protein content of barley and the question of possible adverse correlations are considered in the light of previous literature.
The parents used in the present work were on the one hand European varieties (*Hordeum distichum nutans*) of malting barley and on the other eastern Asiatic forms (*H. hexastichum*) with relatively high protein content but low yield. The method of estimating nitrogen content was a modified Kjeldahl method, using 0·5 grm. of meal.
Single plant determinations of thousand corn weight and relative (percentage) nitrogen were carried out with the parental varieties and from these data the absolute protein content in mg. per grain was calculated. Though certain of the European varieties, e.g. Heils Franken appeared to be homogeneous in respect of nitrogen content others shewed considerable variation and appear to contain lines of different nitrogen content. The Asiatic forms shewed even greater variation. Absence of a correlation between relative protein content and grain size within varieties was indicated by the greater coefficient of variation of the absolute protein content as compared with that of the relative protein content. The Asiatic forms had no higher absolute protein content than the European, though their relative protein content was higher. Crosses between European and Asiatic forms were carried out in 1926–31 and the progenies were continued as populations. In 1935 single plants with at least three fully developed stems were chosen for nitrogen determinations, the relative and absolute contents being determined as before. Again the relative protein content appeared to be independent of grain size.
On theoretical grounds the author concludes that the absolute protein content is a better criterion for selection than the percentage content.
In 1936 the progenies were grown of the 10 plants with the highest and the 10 with the lowest protein content from 23 crosses and average samples of the grain were analyzed from those shewing no segregation in external characters. The results of these analyses are given in extensive tables. The deviations of the 1936 values of the progenies from the 1935 values of the mother plants can be partly explained as due to environment. In certain crosses, however, such as Michigan 04113 × Mittlauer Hanna, in which there was a fairly high average regression, there occurred, besides a large number of progenies with about the same value as their mother plants, some in which there was a much higher regression than the average. This is explained as due to segregation and taken as evidence that nitrogen content is determined by polymeric factors.

From the 1936 progenies data on yield and earliness were also taken and from inspection of the figures it is concluded that there are no correlations between these characters and protein content. The prospects of breeding a variety giving an increased yield of protein per unit area are therefore favourable.
The effect of the selection in 1935 of plants with at least three stems was tested by growing a few unselected populations in 1936 and it is concluded that the selection did not materially alter the distribution of protein values.
It is mentioned that an experiment with winter barleys indicated that an increase in protein yield could not be obtained. The experiments described above were with spring sown barleys.

504. Tavčar, A. 633.16:581.46:575.11.061.6
Nasljedivanje smede-žute boje pljevica kod ječma. (The inheritance of brownish-yellow glume colour in barley).
Arhiv Minist. Polojoprivrede Beograd **1936** : **3** : No. **4** : Pp. 8.
Pure lines of two-rowed white-glumed erect winter barley *Hordeum distichum erectum* were crossed with pure lines of four-rowed brownish-yellow glumed *nutans* winter barley *H. vulgare nutans*. Glume colour shewed a monofactorial inheritance with the brownish-yellow colour as dominant. There was also a monofactorial difference between the glume colour and the *nutans* or erect type of ear. Linkage was found between the genes for glume colour *Gg* and those for row number *Zz* into a crossing-over value of 38·55 per cent.
In crosses between two and four-rowed barley with the same glume colours as in the crosses described above a relatively greater proportion of the parental gene combinations segregated out than if the genes in question were not linked.

505. Hunter, H. 633.16:663.421:575(42 + 41.5)
Some aspects of malting barley breeding in Great Britain.
C.R. V^e^ Congr. Int. Techn. Chim. Industr. Agric. Schéveningue 1937 : Sect. 4 : 291–309.
The author gives an account of the demonstration of the high yield and good malting quality of Archer (*Hordeum distichum nutans*) in tests carried out in Ireland beginning about 1900. A Danish selection of Archer was grown on the Continent under the name Prentice. The superiority of this selection led to single plant selections being made in Ireland and one of these, Irish Archer No. 1, was crossed with Spratt (*H. distichum zeocrithum*) to produce the famous variety Spratt-Archer. The new variety is earlier than Archer, less liable to lodging and yields more grain of slightly higher malting quality.
An outstanding feature of Spratt-Archer is its high tiller survival and the author presents some experimental data indicating that this character is associated with high yield and good malting quality. Nitrogenous fertilizer applied at an early stage in the life of a barley plant causes an increase in tillering and of yield of grain without increasing the nitrogen content (and therefore decreasing the malting quality) of the grain. The same fertilizer, however, applied at a late stage causes little or no increase in tillering but a marked increase in nitrogen content of the grain. Again, artificial removal of tillers causes an increase in nitrogen content and in thousand-grain weight. The author suggests therefore that in varieties of the Archer and Spratt-Archer type the plant breeder's search should be directed towards lines of high tiller survival to obtain high yield and good malting quality.
Recent re-selection experiments with Spratt-Archer have indicated that the variety is not a pure line in the strict sense of the term but is an assemblage of lines differing in physiological characters such as earliness. One of the earlier lines selected has proved to be more prolific and of higher malting quality than any of its competitors. The author suggests that an assemblage of pure lines may make a more useful variety than one pure line, owing to the wider adaptability of the former.
While low nitrogen content is a good general indication of high malting quality, the correlation is not absolute and one of the sister lines of the original Spratt-Archer had a lower nitrogen content than Archer but a lower malting quality than that parent.
The variety Plumage-Archer was bred by Dr. Beaven from the cross between Plumage (*H. distichum erectum*) and Archer, to combine the good malting qualities of Goldthorpe

(also *H. distichum erectum*) with the low loss of ears characteristic of Archer. Plumage-Archer is equal to Spratt-Archer in yield and malting quality. There is evidence that Plumage-Archer does not shew as high a tiller survival as Spratt-Archer, but has a higher ear weight, which is sufficient, in conjunction with medium to high tillering capacity to secure low total nitrogen. There are also indications that varieties of the *erectum* group give a somewhat higher extract than those of the *nutans* group under conditions of equal total nitrogen content.

MILLETS AND SORGHUMS 633.17

506. Heh, C. M., Mei, T. F. and Yang, S. S. 633.171:581.162.3

Anthesis of millet, *Setaria italica* (L.) Beauv.

J. Amer. Soc. Agron. 1937 : **29** : 845–53.

It was found that in Nanking the flowering of millet begins on the fifth day after the emergence of the spike and lasts an average period of 12 days, the peak occurring on the ninth day. Blooming occurs daily between 8 p.m. and 10 a.m., the maximum periods being 10 to 12 p.m. and 8 to 10 a.m.

Low temperature and high humidity favour anthesis.

The flowers can be emasculated when the anthers emerge during anthesis; they take 6 or 7 minutes to complete their emergence, the whole process of anthesis of a flower requiring about 80 minutes.

507. Sieglinger, J. B. 633.174 : 575(73)

New sorghum varieties and principles of pure seed production.

18th Rep. Int. Crop. Impr. Ass. 1936 : 10–13.

Among the new varieties mentioned are Sooner milo, an early maturing variety for grain production, derived from a cross between Early Standard White milo and Dwarf Yellow milo and also Wheatland, bred from a cross between kafir and Dwarf milo.

Studies on resistance to chinch bugs at Lawton, Oklahoma have shewn that varietal resistance is to be found, especially among the kafirs and sorgos. Resistance is inherited in crosses, being apparently dominant or partly dominant, and the breeding of resistant varieties is in progress.

Breeding for resistance to *Pythium* root-rot is in progress in Kansas (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 150) and Texas. Red stripe disease is also being studied in Texas and resistance to it has been found to be recessive in inheritance.

508. Shen, T. H. and Swen, C. I. 633.174:575.14

Effect of selfing in kaoliang.

J. Agric. Ass. China 1934 : No. 123 : 1–15.

The effect of selfing in 36 strains of kaoliang (ultimately reduced to 28) was tested from 1928–32. Each strain was subjected to two treatments, viz., selfed- and uncontrolled-pollination. All the selfed lines of each year were continuously selfed, while each uncontrolled line was again subjected to the above mentioned two treatments, thus constituting a dichotomous plan for each year, and finally, the effect of uncontrolled pollination and self-pollination of one year, two years, three years and that of four years were studied.

Amongst the 88 yield comparisons of three years, only 24 significant differences occurred at random. The uncontrolled lines shewed 2 gains and 1 loss over the one-year selfed, 4 gains and 5 losses over the 2-year selfed, 5 gains and 4 losses over the 3-year selfed, and 3 gains over the 4-year selfed lines. All the other differences were insignificant.

The height of plant, date of earing as well as the percentage of seed setting were not significantly affected by selfing and there was no increase in tillering capacity.

The size of seed, however, using the weight of 200 seeds as a criterion seemed to have been directly influenced. The authors assumed that this was due to the poor development of the seed because of bagging, since an uncontrolled line which had been selfed in the previous year shewed no significant loss as compared with a 2-year uncontrolled line, but the latter significantly surpassed a selfed line, if kept uncontrolled in the preceding year. A 2-year

selfed line shewed no significant loss as compared with a selfed line provided that the latter had been uncontrolled in the previous year; but the 2-year selfed line was significantly inferior to an uncontrolled line selfed in the previous year.
Segregation was observed in the first year of selfing and the yielding capacity seemed to have become constant in the third and fourth year. Nevertheless, a certain amount of heterogeneity was still unavoidable even after 4 years' selfing. The authors concluded that selfing was absolutely necessary for the purification of kaoliang and that 4 years' selfing seemed to be the minimum requirement for this purpose. (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 872). T. C. C.

509. Stephens, J. C. 633.174:581.162.51:575.11:575.12
Male sterility in sorghum: its possible utilization in production of hybrid seed.
J. Amer. Soc. Agron. **1937** : **29** : 690–96.

A male-sterile type found in the variety Texas Blackhull kafir is due to a simple recessive factor which produces incompletely developed anthers without otherwise interfering with the course of blooming.
The possible use of this factor in producing hybrid seed so as to make use of hybrid vigour (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1260) is discussed.

510. Bowman, D. H.,
Martin, J. H.,
Melchers, L. E. and 633.174–2.411.2–1.521.6 : 575.11
Parker, J. H. 633.174 Finney
Inheritance of resistance to *Pythium* root rot in sorghum.
J. Agric. Res. **1937** : **55** : 105–15.

The susceptible varieties used in the crosses were Dwarf Yellow milo, Day milo, Beaver, Custer, kafir x milo (No. 27–317) and Early kalo, the last four being all derived from kafir x milo hybrids. The resistant varieties were Club kafir, Western Blackhull kafir, White kaoliang, Black Amber Sorgo and Resistant Dwarf Yellow milo. The last variety is derived from a single plant selection of Dwarf Yellow milo and its name has since been changed to "Finney". The results in F_1, F_2 and F_3 shewed that susceptibility was due to a single, incompletely dominant factor, inherited independently of coleoptile colour. The inheritance of resistance is not affected by heterosis. Club kafir and Finney carry the same factor for resistance, for a cross between them gave only resistant plants in the F_2.

RICE 633.18

511. Jenkins, J. M. 633.18:575(76.3)
Biennial report of the Rice Experiment Station, Crowley, Louisiana 1935-1936.
La St. Univ., Agric. Mech. Coll., Agric. Exp. Sta. : Pp. 19.

The report contains an account by N. E. Jodon of the progress in improving rice varieties. Until 1932 the work of this nature at Crowley was confined to the introduction of varieties from foreign countries, but in 1932 breeding work was begun, emphasis being placed on artificial hydridization followed by selection. The technique of crossing has been improved and nearly 150 crosses have been made, many of which appear to be giving rise to superior strains, though no strains have yet been subjected to yield tests. Among the more promising crosses are Iola x Blue Rose, Rexoro x Blue Rose and Rexoro x Delitus. Genetic studies are also being conducted with certain crosses.
Hybrid progenies from some 25 crosses were obtained from California. None of the selections obtained from these has yet been chosen for distribution in Louisiana, but some of the better selections have been used as parents in further breeding work. One cross, Edith x Fortuna, has given rise to an exceptional number of early strains with good characteristics and selections from this cross are undergoing intensive testing in competition with early commercial varieties. Variety trials are carried out by the station.

512. Bautista, B. R. 633.18:575(91.4)
Line selection of Khao Bai Sri.
Philipp. J. Agric. 1937 : **8** : 41–47.
Khao Bai Sri is a high quality rice variety shewing variation both in heading and production. By line selection two strains, Nos. 1247–P2–7–1 and 1247–P1–10–6 have been developed from individual plants selected in the field in 1929. They each yield about 69 cavans per hectare as compared with about 60 cavans for the unselected variety and are recommended for commercial planting in areas that can be drained and have medium to fairly good soil with irrigation facilities.

513. Nakayama, K. 633.18:575.11–181.13:581.143
(The growth-limiting effects of dwarf genes on some organs of rice).
Jap. J. Genet. 1937 : **13** : 196–99.
While the genes *A* and *B* for dwarf habit limit the growth of the stem, panicle, lemma, palea and outer glumes in different degrees they have no effect on the growth of pollen grains and little, if any, on that of some component parts of the reproductive organs. No effect of the genes could be detected in the length of the dormant embryo or coleoptiles and radicles and their effects must therefore be considered to appear during the development of young plants.

514. 633.18:576.312
Hsia, Y. S. 633.18:575.24:576.356.5
(A review on cytogenetic studies on *Oryza*).
J. Agric. Ass. China 1937 : No. 162 : 1–14.
The author gives a brief report on the results of cytogenetic studies on *Oryza* obtained by the Japanese investigators from 1909 to 1936. The haploid number is undoubtedly twelve. Mutations due to changes in the chromosome number are reported, viz. haploid, autotriploid, autotetraploid and heteroploid. The haploid type is formed by parthenogenesis. Twelve univalent chromosomes are found in diakinesis which give rise to cells with 0–12 chromosomes. Only those with twelve are viable, so the degree of fertility amounted to only 0·0022 per cent. Diploid tillers (chimaeras) may occasionally occur which shew a higher degree of fertility. A cross between a haploid and a diploid pollen parent gives diploid progeny. Autotriploid types may be formed through combination of haploid and diploid gametes or fertilization of an ovule with more than one male nucleus. The degree of fertility is 1–4 per cent under normal conditions and 30 per cent provided the ovaries are well developed. Trivalent chromosomes are the rule in diakinesis, bivalent and univalent members are only exceptions which are due probably to the dissociation of elements of the trivalents. The offspring of autotriploids are abnormal and sterile because of the irregularity of the chromosome number which ranges from 25 to 29. *O. minuta* Presl. and *O. latifolia* Desv. have been described as autotetraploid plants, the degree of fertility being 30 and 1–4 per cent. as the maximum and minimum respectively. In meiosis there are only 5 to 6 quadrivalent groups and all the other groups bivalents. In another case nine quadrivalents are found in both sexes. Trisomic plants of $2n + 1$ and $2n + 4$ have been found. The former is unable to set seed and the latter is incapable of being fertilized. Autotriploid and autotetraploid forms have been obtained by some investigators through X-ray treatment of the seed of the previous generation but sterility often resulted because of the translocation of the chromosomes. The chromosome number of a part of the cells of the young root is doubled when the sprouts are developed under 42–45·5° C. Autotetraploid individuals are also obtained from the offspring of seedlings treated with chloral hydrate. A cross between cultivated diploid and wild diploid parents gives F_1 plants with a degree of fertility of 1·48 per cent on selfing; while a cross from cultivated diploid and wild tetraploid types gives sterile triploid progenies. The F_1 progeny from two wild tetraploid parents is intermediate and sterile. Theories regarding the basic number of *Oryza* are given, but no conclusion is reached.

T. C. C.

515. Ideko, H. 633.18:581.481:575
[The judging of rice varieties by different types of embryo growth].
Agric. & Hort. Japan 1935 : **2** : 479–84 ; **3** : 748–58.

Ideko, H.
[The judging of rice varieties by different types of embryo growth. (Translated by S. K. Loo)].
J. Agric. Ass. China 1937 : No. 163 : 58–60.

The sprouts of more than 300 varieties of rice, which were germinated in Sachs' culture solution at a constant temperature of 30° C., were compared in order to find out possible varietal differences. The plants were divided into two lots, one kept in a dark room and the other exposed to 260 foot candles white light for 30 minutes.

The sprouts from the dark room shewed that the Japanese and the Indian varieties could be distinguished by the length of the mesocotyl. Those below and above 10 mm. were Japanese and Indian varieties respectively. The lowland and upland varieties of these two groups could be separated by the dimensions of the coleoptile and the first leaf. Lowland varieties shewed bigger coleoptiles than the upland varieties. The first leaf in the upland rice emerged within five days after germination but in the lowland varieties had not done so after eight to nine days. The first leaf was always longer than the coleoptile and the difference might reach a length of 10 mm. in the upland varieties, while in the lowland varieties the first leaf was invariably shorter than the coleoptile.

The earliness was estimated by the size of mesocotyl. The early and late varieties had bigger and smaller mesocotyls respectively, and the size was intermediate for the intermediate varieties.

No significant differences in the embryos could be found between starchy and glutinous varieties, with the exception of the size of mesocotyl which in the starchy forms was superior.

The varieties concerned were classified into four groups according to the ratio between the first leaf and the coleoptile, and between the mesocotyl and the coleoptile, viz. Japanese lowland, Indian lowland, Japanese upland and Indian upland.

According to the author, the lowland rice was more highly developed, while the upland varieties of India retained some of their most primitive characters. T.C.C.

516. Ting, Y. 633.18–1.557:575
(Investigation on rice plant characters with reference to breeding).
J. Agric. Ass. China 1936 : No. 144 : 1–14.

An investigation of the yield components of rice was carried out in 1932, with 950 plants of the early variety, viz. White Starch and 500 plants of the late variety Bamboo Glutinous. The yielding capacity in relation to (1) tillering capacity (number of ears per plant), (2) height of plant, (3) average panicle weight, (4) length of the ear, (5) number of kernels per panicle and (6) weight of grains, were studied. The coefficients of the simple correlation, partial correlation of different orders and the multiple correlation were presented.

The values of the simple and multiple correlations between yield (y) and the various factors were $r_{y1} = \cdot 83 \pm \cdot 007$, $r_{y3} = \cdot 45 \pm \cdot 017$, $r_{y2} = \cdot 32 \pm \cdot 019$, $r_{y \cdot 123} = \cdot 91 \pm \cdot 003$, $r_{34} = \cdot 55 \pm \cdot 015$, $r_{35} = \cdot 58 \pm \cdot 014$, $r_{36} = \cdot 52 \pm \cdot 016$ and $r_{3 \cdot 456} = \cdot 64 \pm \cdot 013$ for White Starch and $r_{y1} = \cdot 93 \pm \cdot 003$, $r_{y3} = \cdot 46 \pm \cdot 024$, $r_{y2} = \cdot 44 \pm \cdot 024$, $r_{y \cdot 123} = \cdot 97 \pm \cdot 001$, $r_{34} = \cdot 64 \pm \cdot 018$ $r_{35} = \cdot 87 \pm \cdot 007$, $r_{36} = \cdot 67 \pm \cdot 016$, and $r_{3 \cdot 456} = \cdot 89 \pm \cdot 006$ for Bamboo Glutinous.

The author concluded that the tillering capacity headed the list of the yield components and the average panicle weight, which seemed to be composed of length of the ear and number of seeds per panicle, was next to it. T. C. C.

LEGUMINOUS FORAGE PLANTS 633.3

517. Sharapov, N. I. 633.367:581.162.31
(On forced self-pollination of lupins).
Bull. Appl. Bot. Leningrad 1937 : Ser. A (21) : 99–104.

The structure of the reproductive organs and the biology of the lupin are described to shew that cross-pollination is possible and that isolation is therefore necessary in breeding work.

As a preliminary to a programme of breeding to produce early, non-shedding forms resistant to *fusarium*, etc., the results of isolation in parchment bags were tested with 5 species: *Lupinus angustifolius*, *L. luteus*, *L. albus*, *L. pilosus* and *L. mutabilis* Sweet. *L. luteus* gave the highest yield of seed, about 45·5 per cent as compared with 50 per cent under ordinary conditions, *L. angustifolius* gave 16 per cent, *L. pilosus* 12·5 per cent, *L. albus* 12 per cent and *L. mutabilis* nil. The thousand corn weight of the seed was normal and the progeny raised appeared so too. In the case of *L. angustifolius* under conditions of isolation the thousand corn weight was actually higher than under ordinary conditions, owing possibly to some unknown factor. Favourable results of the same kind were obtained with the seed from the above plants. The second generation was sown under conditions of spatial isolation and the yield in the third generation differed in no way from the normal.

518. Svirskii, Ja. N. 633.367:581.192.6:575
(Breeding alkaloid-free lupins).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1936 : No. 12 : 5–6.

The work of the White Russian Experiment Station in the production of akaloid-free lupins for fodder by selection and by hybridization is described. Genetic investigations also revealed that the alkaloid-free character was recessive, while pyramidal growth habit and blue colour of the flower were dominant to the "standard" habit and white flower respectively, each of these three characters being conditioned by a single allelomorphic pair. Perennial alkaloid-free varieties have also been bred from *Lupinus polyphyllus* and are to be used for hybridization. These varieties are extremely early and being very winter-hardy they are suitable for northern regions.

519. Sengbusch, R. v. 633.367:581.47:578.081:575
Züchterisch brauchbare Schnellbestimmungsmethoden zur Prüfung der Eigenschaft "Nichtplatzen" von Stamm 3535 A (*Lupinus luteus*). **(A useful method for the breeder for the rapid determination of the non-splitting character of strain 3535 A (*L. luteus*).**
Züchter 1937 : **9** : 255–56.

The ripe pods are boiled for 30–60 minutes in water or better in a 2 per cent solution of caustic soda, soda, persil, etc. After this treatment the sutures can be easily separated from the halves of the pods. The sutures from the splitting pods are joined by parenchymous tissue, those from the non-splitting pods by strands of sclerenchyma. The sutures therefore of the splitting forms separate into two halves while the others remain joined.
It is pointed out that this method only applies to the strain 3535 of *L. luteus*, other non-splitting types may not react in the same way.

520. Sengbusch, R. v. 633.367:581.47:581.192.6:575.11
Die Vererbung der Eigenschaft "Nichtplatzen" des Stammes 3535 A von "*Lupinus luteus*". Vorläufige Mitteilung. **(The inheritance of the "non-splitting" character of the strain 3535 A of *L. luteus*. Preliminary communication).**
Züchter 1937 : **9** : p. 254.

The strain 3535 A of *L. luteus* is a pale-seeded, non-splitting type. Plants grown in the field without isolation gave a certain number of dark-seeded splitting types among their progeny. As both the characters non-splitting and alkaloid-free are recessive it should be possible to breed sweet, non-splitting types if a large enough F_2 is grown.

ROOTS AND TUBERS 633.4

521. 633.4:575(47)
Agapov, S. 635:575(47)
(Breeding and improving varieties of edible root crops).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1936 : No. 12 : 11–12.

A descriptive list is given of varieties of the following root crops, obtained either by family selection or by crossing: beet, carrot, parsnip, turnip and radishes. Most of the varieties

are now being grown on a commercial scale and are recommended for their yield, or flavour, or storage capacity or earliness or, in some cases, a combination of several of these characters. The improved Bordo beet which yielded 15–20 per cent more than the commercial Egyptian beet has already been surpassed in yield by Line B–27 244 by 10–15 per cent and the latter is also somewhat earlier. Also the quality of the flesh of Bordo has been surpassed by the new line p/58. Both B–27/244 and p/58 are undergoing preliminary tests. Carrot breeding is in progress and the F_4 of one promising hybrid form is being examined. Of the radishes, Rds418 and 467 are good yielders with large roots of superior flavour and attain full growth 30-35 days after sowing.

522. COLIN, H. 633.41:575.127.2:633.63:575
L'hérédité des caractères physiologiques chez la betterave. (**The inheritance of physiological characters in beet**).
Ann. Sci. Nat. (10e Sér. Botanique) 1937 : **19** : 93–112.
The results of crossing sugar and forage beets are carefully followed up to the sixth generation and shew the possibility of obtaining lines not less rich in sugar than the sugar beet parent (Cf. "Plant Breeding Abstracts", Vol. VII, Absts. 1014 and 1015).
The results of crossing with wild species of *Beta* are discussed. By this means it is hoped among other advantages to improve further the yield, earliness and resistance to diseases.

523. MUNERATI, O. 633.41 : 581.2 : 575.12
Les méthodes appropriées à une rapide séparation des races à nombre élevé d'anomalies provenant d'individus tératologiques à choisir parmi les types ordinaries de betteraves. (**The appropriate methods for a rapid separation of races with a high number of anomalies derived from abnormal individuals from among the ordinary types of beets**).
Publ. Inst. Belge Amélior. Better. 1937 : **5** : p. 86.
The power of transmitting teratological characters is limited to a small number of individuals. Crosses made between two teratological plants may produce abundant teratological material.

524. SMITH, O. 633.491(8 + 47)
Some factors affecting culinary quality of potatoes.
Amer. Potato J. 1937 : **14** : 221–24.
Some of the South American potatoes which form few tubers in Leningrad have given quite high yields in Western Pamir. Interspecific hybrids and European varieties have given 2 or 3 kilogrammes per plant. These high yields are attributed partly to short day length and partly to the peculiar conditions in these high regions, all above an altitude of 2,000 metres. Some data are given on the frost resistance of South American species and hybrids.

525. VOLKART, A. 633.491:575(43)
Sortenwahl und Saatguterzeugung im Kartoffelbau. (**Choice of varieties and seed production in potato cultivation**).
Schweiz. landw. Mh. 1937 : **25** : 2–24.
The lecturer's methods and results of potato cultivation are described and the special problems connected with the maintenance of a satisfactory collection of varieties are discussed. The importance of further improving the types of potatoes grown in Switzerland is stressed.

526. KRANTZ, F. A. 633.491:575(73)
Progress in breeding improved varieties of potatoes.
Minn. Hort. 1937 : **65** : p. 65.
Early breeding work in the U.S.A. is briefly reviewed. After the introduction of the Rural type in 1886 there followed a period of almost 50 years in which no variety of any importance was introduced. The present activity in that country is attributed to the development of fertile breeding stocks by the United States Department of Agriculture and the Minnesota

Agricultural Experiment Station. The varieties so far produced are Katahdin, Chippewa, Warba, Golden and Houma and the first three are already proving popular. Golden and Houma are of too recent introduction to estimate their popularity.

527. 633.491:575"793"(47)
VESELOVSKY, I. A. 633.491:575.127.2"793"
Some new achievements in breeding potatoes for earliness.
Amer. Potato J. 1937 : **14** : 295–97.

Some of the intervarietal, *S. tuberosum* crosses giving early hybrids are Cobbler x Jubel (wart-immune), Di-Vernon x Cobbler, Epicure x Cobbler, Cobbler x Fürstenkrone and Epicure x Alma.

In the F_1 of the cross *S. andigenum* x *S. tuberosum* the following characters are dominant: late maturity, fertility, ability to form tubers and a large number of tubers to the cluster. By back-crossing with early commercial varieties a combination of the following characters has been obtained: early formation of tubers, short period of tuber development, early normal completion of the vegetative period and high productivity. Outstanding crosses are Early Rose x F_1 (*S. andigenum* var. *taccla* x Fürstenkrone), Epicure x F_1 (*S. andigenum* var. *tocanum* x Centifolia) and Early Rose x F_1 (*S. andigenum* var. *tocanum* x Centifolia).

528. PROPACH, H. 633.491:575.127.2:576.356.5
Cytogenetische Untersuchungen in der Gattung *Solanum*, Sect. *Tuberarium*. II. Triploide und tetraploide Artbastarde. **(Cytogenetical investigations in the genus *Solanum* sect. *Tuberarium*. II. Triploid and tetraploid interspecific hybrids).**
Z. indukt. Abstamm.- u. VererbLehre 1937 : **73** : 143–54.

The triploid hybrid (2n = 36) studied was *S. acaule* (2n = 48) x *S. chacoense* (2n = 24). Analysis of 50 cells at metaphase I of meiosis gave an average per cell of $6{\cdot}40_{I} + 8{\cdot}72_{II} + 4{\cdot}10_{III}$. The tetraploid hybrid (2n = 48), *S. demissum* var. *klotzchii* (2n = 72) x *S. verrucosum* (2n = 24), gave from a similar analysis $2{\cdot}48_{I} + 17.64_{II} + 0.90_{III} + 1{\cdot}96_{IV}$. The tetraploid hybrid *S. demissum* f. *xitlense* (2n = 72) x *S. chacoense* was also studied and though sufficient well fixed cells for analysis were not obtained, there was evidence that the chromosome conjugation was similar to that in the former tetraploid hybrid.

The similarity between the author's data and those obtained by Upcott in autotriploid and autotetraploid tomatoes is pointed out and the conclusion reached that the polyploid *Solanum* forms studied are auto-polyploids, though it is conceded that minor structural differences between corresponding chromosomes of the different genoms probably occur.

The regular bivalent formation which occurs in the polyploid species, in spite of their auto-polyploid nature, is discussed.

529. JUZEPCZUK, S. W. 633.491:576.16
New species of the genus *Solanum* L. in the group *Tuberarium* Dun.
Bull. Acad. Sci. U.S.S.R. 1937 : No. 2 : 295–331.

The section *Tuberarium* Dun. is comparable in its great size and diversity to the European genus *Rosa* L. A knowledge of the taxonomy is of great importance in deciding the origin of the cultivated potato, a question that has not yet been definitely settled. The author has made an extensive study both in South America and in the collection grown at Leningrad of a great number of forms belonging to species hitherto undescribed.

A need for descriptions of some of these species, already widely known in genetics and cytology, has been felt, in order to legalize the names according to international rules. An exhaustive taxonomical study of the whole section is at present in the press.

Latin descriptions of 21 species are given here, with discussions on their affinities. These are:- *Solanum Looseri, S. Vavilovii, S. Bukasovii, S. Abbotianum, S. aracc-papa, S. catarthrum, S. Molinae, S. leptostigma, S. Herrerae, S. Urubambae, S. acroglossum, S. semidemissum, S. vallis-Mexici, S. punae, S. depexum, S. gibberulosum, S. Parodii, S. Garciae, S. Emmeae, S. Knappei* and *S. Schickii.* J. G. H.

530. HELLBO, E. 633.491:578.081:535.61–31
Om sortäkthetsbestämming av potatis med tillhjälp av ultraviolett ljus. (**On the determination of varietal distinction in potatoes with the help of ultra-violet light**).
Medd. Frökontrollanst. Stockh. **1936** : No. 11.
The results of a number of tests of this method for the identification of varieties shew that while a large number of Swedish varieties could be distinguished with certainty, when dealing with larger numbers the differences would be so slight that the varieties could only be placed in groups with the same fluorescence. Damage by disease and frost alters the fluorescence.

531. KAWAKAMI, K. 633.491:581.143.26.04:575
[**New potato strains sensitive to ethylene chlorhydrin (résumé).**]
Agric. & Hort. Japan **1937** : **12** : 713–22.
The tubers of certain varieties of potatoes produce sprouts more easily than others in response to treatment with ethylene chlorhydrin. Some of the strains bred at the Iwate Agricultural Experiment Station, Morioka, combine sensitivity to this treatment with high productivity.

532. LAMM, R. 633.491:581.331.1:581.162.51
A contribution to the embryology of the potato.
Svensk Bot. Tidskr. **1937** : **31** : 217–20.
The potato variety Up-to-date, although flowering abundantly, is totally sterile. Most embryo sacs abort, but a few develop normally with no irregularities in meiosis. The cause of female sterility therefore awaits further investigation. J. G. H.

533. 633.491:581.6:575
KAWAKAMI, K. 633.491–2.8–1.521.6
(**Value of some potato varieties as materials for breeding tuber character**).
Agric. & Hort. Japan **1934** : **9** : Pp. 3.
The seedlings obtained from different crosses were graded into three classes A, B and C according to their tuber colour, size and eye. The percentages of class A seedlings obtained are given in tabular form. Deodara and Pepo gave good percentages of class A seedlings both in crosses with other varieties and in selfings. It is considered possible to combine the quality of Deodara and Pepo with the virus resistance of Yoimo, Kintosi and Jersey Red Skin.

534. STELZNER, G. 633.491–2–1.521.6:575
Resistenzzüchtung bei Kartoffeln. (**Breeding for resistance in the potato**).
Forschungdienst **1937** : **4** : 261–66.
In this lecture the work on the breeding of potatoes resistant to the most serious diseases is briefly reviewed, including the results already achieved and the lines for future research. The existence of eight biotypes of *Phytophthora infestans* makes further crossing necessary with the immune wild forms *Solanum demissum* Tlaxpehualcoense, *S. demissum* El Desierto and other resistant species, in order to produce a number of resistant forms with a high-yielding capacity. Degeneration causes a very considerable annual loss in yield and of the many causes responsible, virus diseases are perhaps the most important. There are, however, resistant varieties and Müller has produced a clone resistant both to *Phytophthora* and to virus. A similar strain has also been produced at Müncheberg by crossing the wild *S. chacoense* with a variety of *S. tuberosum*. This latter hybrid has 48 chromosomes, is fully fertile and after being vegetatively propagated for 6 years shews no sign of virus disease.
Frost resistance provides another problem for the breeder and here the main difficulty lies in the lack of a suitable laboratory method for determination. *S. acaule* is the most resistant of the wild species, other species are used in crossing and a triple hybrid between *S. acaule*, *S. demissum* and *S. tuberosum* has been produced.
To control attack by the Colorado beetle resistant forms are being sought and of the wild species, *S. demissum*, *S. Jamesii*, *S. Commersonii* and *S. Caldasii* are only slightly attacked and it is hoped in time to breed satisfactory resistant varieties.

The use of *S. andigenum* in crosses makes it possible to produce drought resistant varieties as it transmits its abundant root-system to its progeny.
The breeding of forms resistant to *Rhizoctonia solani*, to *Bacillus phytophthorus* and to *Alternaria solani* offers further problems for the plant breeder.

535. Muller, H. R. A. 633.491–2–1.521.6:575(92.2)
De aardappelsituatie op Java als gevolg van het optreden van eenige nieuwe ziekten. (**The potato situation in Java as a result of the occurrence of some new diseases**).
Landbouw 1937 : **13** : 285–313. Also Korte Meded. Inst. PlZiekt. Buitenz. 1937 : No. 23 : Pp. 29.

Among the investigations carried out by the Institute for Plant Diseases in Java in 1936 was a test of 300 varieties of potatoes from Europe and America for resistance to brown rot (*Bacterium solanacearum* E.F.S.). Among the varieties shewing a certain degree of resistance were Koninkjes, Kentang Djawa, Kentang Djawa (from Bali), Kentang Djawa Peotih, Botergele, Arran Comrade, Epicure and Green Mountain. As no immune variety was found, crosses of varieties of *S. andigenum* and *S. Antipoviczi* with cultivated forms are to be made in hopes of obtaining an immune form.
Phytophthora infestans (Mont.) de Bary has also been recorded in Java and data on the comparative resistance of the different indigenous and other varieties grown have been collected and it is hoped that forms resistant both to the leaf and tuber injury may be found. The strain of *Phytophthora* involved is apparently the same as that found in Holland.
Colletotrichum atramentarium (B. et Br.) Taub. was also recorded in imported tubers in 1936. An attempt is being made to raise seed potatoes free from infection in quarantine plots, planted from only slightly infected tubers.

536. 633.491–2.111–1.521.6:575
Dremliug, L. A. 633.491:575.127.2:576.312
A frost-resistant triple potato hybrid *Solanum acaule* x *S.tuberosum* (Fürstenkrone) x *S. tuberosum* (Centifolia).
C.R. (Doklady) Acad. Sci. U.R.S.S. 1937 : **16** : 423–26.

S. acaule which withstands temperatures of − 8° C. and gives tubers under short-day conditions at Khibiny as well as at Leningrad and Moscow was crossed with *S. tuberosum* var. Fürstenkrone. The hybrids have a low pollen fertility, 20–30 per cent, and withstand temperatures of − 3° C. During the autumn of 1934 when the temperature was low the hybrids were crossed with Centifolia. From the few seeds obtained 7 plants were grown, of which two produced some very small tubers. From these six plants were raised. Pollen fertility varied from 35·5–82 per cent but seed balls with a considerable number of seeds were formed. Temperatures of − 5·5° C. were successfully withstood. Further crosses were made with varieties of *S. tuberosum*, Centifolia, Fürstenkrone and Veselovsky's Seedling 423 to improve tuber formation. A cytological investigation shewed 72 and 74 2n chromosomes in the root tips of one of the hybrids. The non-reduction of a gamete of the hybrid *S. acaule* x Fürstenkrone due to the low temperatures prevailing at the time is suggested in explanation. Cells with 139–142 chromosomes were also observed in some cells of the root tip in one of the hybrids. What is taken to be secondary association was observed during meiosis. Tetrad formation was regular.

537. Reddick, D. 633.491–2.112–1.521.6:575
Blight immune, drought tolerant potatoes.
Amer. Potato J. 1937 : **14** : 205–10.

The author discusses the value of certain varieties as pollen parents and the drought resistance of varieties and hybrids. In connexion with drought resistance he mentions a Peruvian species, *Solanum neoweberbaueri* which is reputed to grow on rocks where no rain falls and which should therefore have very high drought tolerance.

538. 633.491–2.411.4–1.521.6:575(47)
SIDOROV, F. F. 633.491:575.127.2
(Breeding of potatoes for immunity to *Phytophthora infestans* DB.)
Bull. Appl. Bot. Leningrad 1937 : Ser. II (11) : 5–79.
A full account of the work at Krasnyi Pakhar and other centres in the U.S.S.R. already reviewed in "Plant Breeding Abstracts", Vol. VIII, Abst. 165.
A bibliography is given.

539. KARGAPOLOVA, N. N. 633.491–2.411.4–1.521.6:581.8
(Anatomical peculiarities of potato species and varieties differing in their resistance to *Phytophthora infestans*).
Bull. Appl. Bot. Leningrad 1937 : Ser. II (11) : 215–26.
Investigations with wild and cultivated species and varieties of *Solanum* shewed no correlation between their resistance to *Phytophthora* and the anatomical or morphological characteristics of the tubers, stems or leaves. Such characteristics cannot therefore be used as a basis of selection in breeding for *Phytophthora* resistance.
A bibliography is appended.

540. GARBOWSKI, L. and
LESZCZENKO, P. 633.491–2.412.5–1.521.6:575
Badanie odporności ziemniaków na raka ziemniaczanego *Synchytrium endobioticum* (Schilb.) Perc. Sprawozdanie IV. [**Experiments on the resistance of potatoes to wart *S. endobioticum* (Schilb.) Perc. 4th report**].
Prace Wydziału Chorób Roślin Państwowego Instytutu Naukowego Gospodarstwa Wiejskiego w Bydgoszczy 1936 : No. 15 : 43–60.
The results of tests for resistance to wart of a number of varieties of potatoes by artificial infection in the laboratory and in the field shewed that the following Polish varieties are resistant:—Ajaks, Atena, Barbara, Cella, Hajduk, Herkules, Hymen, Ikar, Ilion, Iris, Kastor, Kazimierz, Mentor, Neotopaz, Orkan and Nr. 201 Płomyk. There follows a brief review of the literature of the genetics of resistance to wart and the importance is stressed of basing conclusions on infection tests made in the laboratory rather than in the field.

541. EMME, H. 633.491–2.7–1.521.6:575.127.2
(Hybrids of *S. Emmeae* Juz. and *S. Commersonii* Dun. species resistant to the Colorado beetle—genetical study II).
Biologičeskii Žurnal (Biologicheskij Zhurnal) 1937 : **6** : 299–310.
According to Trouvelot certain species of *Solanum* exhibit resistance to *Leptinotarsa decemlineata* and an attempt is now in progress in the U.S.S.R. to breed a variety of potato that shall be resistant to the Colorado beetle and also, possibly, to *Phytophthora*. An analysis of the following initial crosses between *Solanum* species is recorded here:—*Emmeae* x *Rybinii* (and the reciprocal), *Kesselbrennerii* x *Emmeae*, *Emmeae* x *cathartrum* (and the reciprocal), *ajuscoense* x *Emmeae*, *Antipoviczii* x *Emmeae*, *Commersonii* x *Emmeae* and *Commersonii* x *Antipoviczii* var. *Gandarae*. Available data from various sources on the facility with which certain crosses can be made would seem to indicate that *Pinnatisecta* and *Tuberosa* are relatively distantly related groups.
The somatic chromosome number of all the hybrids of *Emmeae* (2n = 24) with 24 chromosome species was 24. The first and second divisions were normal, secondary pairing, however, indicating tetraploidy of the parent species. In the F_1 from *Commersonii* x *Emmeae* 2n was about 34, which suggests that the gametes from *Commersonii* had probably 22 chromosomes. In the hybrids from *ajuscoense* x *Emmeae* and *Antipoviczii* x *Emmeae* about 36 somatic chromosomes were found. These hybrids did not flower and shewed poor development in general. In three F_1 seedlings from *Commersonii* x var. *Gandarae* 2n was 46 and 48, which supports the view that *Commersonii* produces gametes containing 22 and 24 chromosomes.

Brief notes are given on the behaviour of the following characters in certain crosses: luxuriance of growth, leaf size and form, type of calyx and corolla, length of stamens, aborted pollen, types of stigma, set of berries, stolon length, tuber shape and colour, length of day requirements for tuber formation, frost resistance, starch content and disease resistance.
In regard to a number of characters var. *Gandarae* and other representatives of the *Longipedicellata* group shewed dominance over the species of *Tuberosa* and *Commersonii* (Cf. "Plant Breeding Abstracts", Vol. VII, Absts. 1278 and 1281)—an observation which is interpreted as indicating the relatively great age of *Longipedicellata*.

542. Jones, L. K. and Vincent, C. L. 633.491–2.8–1.521.6:575
The susceptibility of potatoes to the vein-banding virus.
J. Agric. Res. 1937 : **55** : 69–79.

Tests with seedling clones developed from crossing and selfing American Wonder, Bovee, Russet Burbank, Early Northern, Early Six Weeks, Irish Cobbler, Jersey Red Skin, Katahdin, Keeper, Late Rose and McCormick varieties and their seedling progeny have shewn that only Katahdin transmits resistance to infection by the vein-banding virus (potato virus 20). Of 1,572 clones with Katahdin as parent, 89 remained virus-free in the field for 2 to 4 years. All clones without Katahdin as parent became 100 per cent infected during the 2 to 12 seasons they were grown in the field.
Varieties shewing some resistance to infection by the vein banding virus were Chippewa, Green Mountain, Katahdin and Russet Burbank, while Bliss Triumph, Early Rose, Gold Coin, Irish Cobbler, Warba and U.S. Seedling 41956 were very susceptible.

543. King, J. R. and Bamford, R. 633.492:576.312.35:576.356.5
633.492:575.127.2
The chromosome number in *Ipomoea* and related genera.
J. Hered. 1937 : **28** : 279–82.

The chromosome numbers of some 27 species, belonging to *Ipomoea* and the related genera *Quamoclit*, *Operculina*, *Calonyction* and *Merremia* are recorded. All the *Ipomoea* species have 2n = 30 except *I. ramoni* Choisy which has 2n = 60 and *I. batatas* which has 2n = 90 approximately. In *Quamoclit* there are forms with 2n = 30 and with 2n = 28. *Q. Sloteri* Hort. appears to be an amphidiploid derived from a hybrid of two such forms and has 2n = 58. Of the *Quamoclit* hybrids produced by the authors those from parents with the same chromosome number were fertile while those whose parents had different chromosome numbers were sterile.
In *Ipomoea* 500 interspecific and intervarietal pollinations were made but without any success.

FIBRES 633.5

544. Avtonomov, A. I. 633.51:575–181:581.47
(Breeding work with Egyptian cotton).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1936 : No. 12 : 7–9.

An article dealing mainly with the improvement by selection within the varieties Pima and Maarad which were among the Egyptian forms imported into the U.S.S.R.
In order to increase the size of the boll crosses have also been made between Egyptian cotton and the perennial species *Gossypium peruvianum*, which, however, being sterile under Russian conditions, had to be grown under short day illumination (9 hours) in order to obtain the cross and an F_2. In the F_1 the boll was of intermediate size, while in the F_2 2 3 per cent of the annual plants had larger bolls, the female parent in these cases being the perennial species. On sowing seeds from the plants with larger bolls separately segregation occurred in the F_3 and 12–15 per cent of the progeny had large bolls. In F_5, lines with this characteristic as well as earliness have been obtained. It is hoped that ultimately a variety combining these features with other desirable characteristics of Egyptian cotton will be produced.

545. 633.51:575.127.2(54.8)
RANGANATHA RAO, V. N. 633.51 H.190
New cotton varieties from a species cross. Mysore cottons and their improvement II.
J. Hered. 1937 : **28** : 311–16.

A brief survey of early work on interspecific crosses within indigenous Indian cottons is given. The object of the present work was to develop a variety equalling Broach cotton in quality and suitable for cultivation under Mysore conditions. *Gossypium herbaceum*, Kumpta variety, selection 69, with yellow corolla, fuzzy seeds and shallow, broad-lobed leaf was crossed with *G. arboreum*, with red corolla, green seeds and deep, narrow-lobed leaf. The corolla colour, seed colour and leaf shape of *G. arboreum* were dominant in the F_1 and in the later generations selection for such useful characters as earliness, low fruiting branches, ginning out-turn and lint quality was pursued in the eight possible classes given by the different combinations of the dominant and recessive conditions for the corolla, seed and leaf characters.

Two valuable new strains have been produced and the qualities of one of these, H.190, warrant its distribution to the growers. It has a yellow corolla, broadly lobed leaf and green seeds, a staple length of $\frac{7}{8}$" to 1", a yield of 300 to 350 lbs. of seed cotton per acre, a ginning out-turn of 30 per cent, good quality and good class lint spinning 32s. to 35s., giving a test of 80 to 85 lbs. at 19s. and with a good white colour. It is susceptible to wilt, but the selection of a wilt resistant strain is in progress. Its green seeds enable it to be identified in the field after the fruit has opened. The other selection, Strain 19, has a broad-lobed leaf, red corolla, green seeds and a ginning out-turn of 30 per cent, but its yield on a field scale has yet to be determined.

546. KANAŠ, S. S. 633.51:575.127.2:576.312.35:576.356
(Hybridization work with species of cotton with different chromosome numbers).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1936 : No. 12 : 9–10.

An account from the Transcaucasian Section of the Central Breeding Station of the work that has been done with crosses between 26 and 52-chromosome species of cotton. In the majority of the crosses the F_1 had 39 chromosomes as the somatic number, except in the cross of *Gossypium barbadense* × *G. herbaceum* in which 2n equalled 52 as a result of the combination of the haploid complement of the first species with two haploid complements of the second species.

The general sterility noted in the F_1 generations was to some extent eliminated by repeated crossing with 52-chromosome species. A similar improvement in fertility was noted when the F_1 pollen was used on the parent forms.

Hybrids from the first back-cross were more fertile than the F_1 and some forms even attained 10 per cent fertility, but others shewed a much lower percentage. Morphological features also varied greatly, while at the same time there was a marked predominance of the characters of the 52-chromosome species. In some back-crosses characters absent in the parents appeared.

The chromosome complements of some of these various forms and of 65-chromosome hybrids (resulting from non-reduced F_1 ♀ gametes with 39 chromosomes pollinated by 26-chromosome pollen) are mentioned, with general observations on the cytological findings in the F_2 generations and back-crosses from crosses involving two or three species. Data are also cited as shewing that constant forms can be attained sooner in crosses between species of different chromosome number than in crosses of species with the same chromosome number or even in intraspecific crosses.

547. TANAKA, M. 633.51:575.127.2:578.08
The application of ringing and wiring to interspecific crosses of the genus *Gossypium*.
Mem. Coll. Agric. Kyoto 1937 : No. 39 : 1–7.

Reciprocal crosses were made between *G. herbaceum* L. and *G. hirsutum*. Immediately after pollination the flowers were divided into three groups. Those in the first group were left

untreated, those in the second were bound tightly with wire round the internode immediately below the pollinated flower and those in the third group were ringed at this point as well as having other flower buds and apical growing points removed. The object of the treatments is to increase the supply of food materials to the pollinated flower.
Both treatments increased the percentage of bolls set, ringing being more effective than wiring. Only empty seeds were obtained from the cross *G. herbaceum* × *G. hirsutum* (2n × 4n) but the fewer seeds obtained from the reciprocal cross were apparently viable; their germination has not yet been tested.

548. Richmond, T. R. and Harper, R. E. 633.51:575.242:581.45:575.11
Inheritance of okra-leaf and round-leaf in Upland cotton. A note on Brown's and Cotton's data.
J. Hered. 1937 : **28** : 215–16.
The authors point out that the results obtained by Brown and Cotton (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1300) can be explained by the assumption that the round leaf of their mutant is governed by a single recessive factor (*rl*) segregating independently of the factor pair O_o (okra leaf)–O_n (normal leaf).

549. Chiang, S. C. 633.51:581.162.3:578.08
(Reviews of emasculate methods in cotton).
J. Agric. Ass. China 1937 : No. 163 : 87–90.
C. C. Doak's new method of emasculation (which the author of the present paper terms Beasley's method (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 409) and the old one were compared regarding the economy of labour and the percentage of fertilization after artificial pollination. This and the average number of seconds spent on each flower were 40·5 per cent and 37·7″ for the old and 39·9 per cent and 11·5″ for Doak's method. T. C. C.

550. McNamara, H. C. 633.51:581.162.31:578.08
A simple method of self-pollinating cotton flowers.
J. Amer. Soc. Agron. 1937 : **29** : 706–07.
A saving in time in selfing and tagging cotton flowers can be effected if the tags themselves are strung with copper wire instead of string, the wire being coiled around the corolla to prevent it from opening.

551. Tu, C. P. 633.51:581.162.32:578.081
(A study on natural crossing in cotton).
J. Agric. Ass. China 1934 : No. 125 : 1–18.
The percentage of natural crossing in the American Trice and China T.H. was tested using the method suggested by Dr H. H. Love. The test was practiced in Tinghsien and was repeated in Chaicheng, a village about ten miles from the former. The number of flowers emasculated every morning for each variety was ten for Tinghsien and twenty for Chaicheng. Beside each emasculated flower, a non-emasculated flower was attached with a white string in order to find the percentage of shedding or else the percentage of total fertilization, because all the unfertilized flowers usually shed. The percentage of natural crossing, therefore, had to be obtained by dividing the percentage of fertilization of the emasculated flowers as evidenced by the number of bolls formed by the percentage of fertilization of the non-emasculated flowers. The author did not trust his own manipulation to be absolutely reliable, so another set of flowers were emasculated and instead of being pollinated, they were isolated and later among them from 0 to 18·5 per cent were found to be fertilized, which was said to be due to artificial contamination. Thus the result had to be corrected in order to get the so-called net percentage of natural crossing. In one case the percentage of fertilization of the emasculated flowers among the American Trice was 52·1 (cross-fertilization only) and that of the non-emasculated flowers was 31·5 (cross-fertilization plus self-fertilization, i.e. total fertilization). The net percentage of natural crossing was obtained by dividing the difference between 52·1

and 18·5 (the highest percentage of artificial contamination) by the 31·5 and eventually a percentage of 106·7 was obtained. The net percentage of natural crossing thus computed for other cases were 87·1, 75·9, 66·0 and 64·3 for the American Trice and 8·4, 31·3, 80·4, 47·5 and 10·9 for China T.H.

In order to find the best preventive for natural crossing, another test was made. American Trice and China T.H. were surrounded by sorghum to see to what extent the visits by bees could be prevented by the latter. In one case the percentages for those surrounded and those not surrounded were 52·3 and 66·0 for the American Trice and 10·9 and 47·4 for China T.H., while in another case the percentages were 65·7 and 64·3 for Trice and 26·1 and 10·9 for China T.H. because of the previous defoliation of the sorghum plants. The author, therefore, concluded that sorghum might have an effect on checking the natural crossing of cotton provided that it was not defoliated. In a separate test the author found a varietal difference between two Chinese varieties, China T.H. and China Silk which shewed 10·9 and 69·3 per cent of cross-pollination respectively.

The cotton flowers were observed to be most often visited by the honey bees, the frequency being influenced by the kind of the surrounding crops as well as the time of the day. Buckwheat and sesame were assumed to be preferred by the bees, for the percentage of natural crossing of cotton was seen to be decidedly reduced at the blooming period of the former in the nearby plots. The peak of the frequency of the visits to the flowers during the day was at 2.00 p.m. and this would give a good explanation of another observation that the flowers were most frequently cross-pollinated at 2.00 p.m. (Cf. also Abst. 552). T. C. C.

552. Yu, C. P. and Hsieh, L. C. 633.51:581.162.32:578.081

(A discussion on the methods of studying the percentage of natural crossing in cotton).

J. Agric. Ass. China 1937 : No. 160 : 1–16.

This paper firstly gives a criticism of the method employed for testing the percentage of natural crossing in cotton suggested by Dr H. H. Love. This was obtained by taking the percentage of bolls borne by the emasculated flowers. The same amount of untreated flowers are tagged to find out the percentage of shedding under natural conditions.

Results of seven crop improvement stations are given, which range from 0·45 to 89·9 per cent. In one case, as the authors remark, the percentage runs as high as 106·7 per cent (!). The discrepancy in the results obtained at these stations is said to be due to the unsoundness of the method for the following reasons: (1) that selective fertilization, i.e. the pollens of the same type are preferred by the ovules, is a proven fact; thus the cross fertilization in the emasculated flowers is unexpectedly high; (2) that a mechanical injury is unavoidably caused to the peduncles of the flowers during the manipulation and thus the percentage of shedding in the emasculated flowers is increased; (3) that it is a known fact that unfertilized ovaries do develop and sometimes are not shed within ten days; moreover, parthenogenetic bolls may occasionally occur, so that apparently, the development of bolls cannot always be taken as an evidence of fertilization; (4) that the size of population suggested by Love, namely, 500, ten being emasculated each day, is too small; (5) that the work is too laborious.

The authors prefer another method employed by many earlier investigators. Two varieties of cotton with contrasting characters are planted together and the percentage of natural crossing revealed by the percentage of dominant plants occurring among the progeny of the recessive type.

Different systems of planting as well as the results obtained by Prof. C. C. Feng are listed. Seedling colour is used as an indicator of natural crossing. The average results shew 30·63, 26·50 and 20·42 per cent for three different systems of planting on the basis of the number of bolls and the general average is 7·79 per cent on the basis of seed number. The results vary with the methods employed, as well as the years. The results for various distances between the varieties are 5·64 per cent for 7·5 ft. and 0·28 per cent for 75·0 ft. The requisite distance for plots in order to prevent the different pure varieties from becoming mixed can easily be determined. T. C. C.

553. Christidis, B. G. 633.51–1.557–1.421
Competition between cotton varieties: a reply.
J. Amer. Soc. Agron. 1937 : **29** : 703–05.
In the article reviewed in "Plant Breeding Abstracts", Vol. VII, Abst. 1303, Quinby, Killough and Stansel stated that the data given by Christidis in a previous article (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 882) could be interpreted in harmony with their conclusion that competition is not an important factor in cotton variety tests. In the present note Christidis points out that this conclusion is based on an arithmetical error.

554. 633.51–2.484–1.521.6:575
Fahmy, T. 633.51 Giza 27
Giza 27, a wilt immune strain of long staple cotton.
Bull. Minist. Agric. Egypt 1937 : (Mycol. Sect.) : No. 176 : Pp. 13.
The new strain was developed from the cross Giza 7 x Sakha 3 by routine selection for resistance to *Fusarium* wilt, and for lint quality and yield. Giza 27 has better lint quality but a lower yield than its immune parent, Giza 7, while it surpasses Sakha 3 in yield. Owing to its lower yield as compared with Giza 7 it has not yet been decided whether Giza 27 will be released.

555. Anderson, E. 633.512:575.127.2
An experiment study of hybridization in the genus *Apocynum*.
Ann. Mo. Bot. Gdn. 1936 : **23** : 159–68.
Specimens of *A. cannabinum*, *A. androsaemifolium* and *A. medium* were investigated on the basis of pollen fertility and genetical results. The low pollen fertility and the variable progeny of *A. medium* confirms its hybrid origin. On the basis of resemblance of some of the progeny the two other species are regarded as the putative parents.
The question of the classification of the variant types is discussed.

556. Slinin, A. 633.52:575.42(47)
(**Breeding flax for fibre**).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1936 : No. 12 : 6–7.
A number of new varieties of flax obtained by selection in the U.S.S.R. are stated to be superior to other Russian varieties in yield and quality of fibre and in yield of seed. They are also immune to *Melampsora lini*. When the process of multiplication is completed they are to be used commercially and a varietal mixture called Omega, composed of these rust resistant forms is being multiplied for use in certain districts.

557. Robinson, B. B. 633.52:581.162.32
Natural cross-pollination studies in fiber flax.
J. Amer. Soc. Agron. 1937 : **29** : 644–49.
Data on the frequency of natural crossing were obtained by growing blue and white flowered varieties in adjacent rows. Allowing for crossing within the variety as well as that from the adjacent variety, the total crossing may be as much as 5 or 6 per cent in Michigan and 1 or 2 per cent in Oregon. There was in general more crossing when the blue flowered variety was seed parent than when the white flowered variety was.
It is concluded that precautions to prevent natural crossing are required if the purity required by the seed laws is to be reached.

558. Neuer, H. 633.522:575(43)
Grundsätzliches zum Hanfbau und zur Hanfzüchtung. (**Essentials in hemp cultivation and breeding**).
Faserforschung 1937 : **12** : 192–97.
The essentials for the cultivation of hemp in Germany are discussed and the necessity is stressed for the breeding of forms which will set sufficient seed for purposes of propagation under the climatic conditions of Germany.

559. 633.522:575"793"(47)

(Notes).

Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) **1937** : No. **3** : p. **42.**

The Institute of Plant Industry, Leningrad which has already produced a late maturing central Russian hemp, has bred a new early, tall, Italian variety of this crop with the male and female plants maturing simultaneously. In addition to being 50 days earlier than the standard Italian types the yield of seed is 25 per cent higher than that of existing varieties. From this new variety, monoecious forms have been obtained from a somatic mutation. Élite seed is to be obtained next year for large-scale tests.

560. Bredemann, G. 633.522:575.42

Züchtung des Hanfes auf Fasergehalt. (**Breeding hemp for fibre content**).

Forschungsdienst **1937** : **3** : 398–410.

The author's method for the determination of the fibre content of male plants to be used in hybridization is described and details are given of the results of selection for high and low fibre content extending over three years.

By selecting female plants with a high fibre content and pollinating them only with pollen from male plants also with high fibre content, increases in fibre content of 20 and 30 per cent were obtained.

The results of the negative selection, for low fibre content, were not so marked but were sufficient to shew that the use of plants of low fibre content as male parents will definitely lower the yield in fibre of the progeny.

561. Crescini, F. 633.522:677.1:577.8

Über das Verhalten der männlichen und weiblichen Pflanzen des italienischen Hanfes in Bezug auf ihre Faserquantität und -qualität. (**On the behaviour of male and female plants of Italian hemp in respect of their fibre quantity and quality**).

Züchter **1937** : **9** : 130–33.

The results are given of an experiment in which the male and female plants of a field of hemp were retted separately. It is concluded that such a measure is not justified commercially.

562. 633.524.1:576.312.35:576.353

Eichhorn, A. 633.372:576.312.35:576.353

Numération chromosomique et étude de la mitose chez deux *Crotalaria*. (**Chromosome number and study of mitosis in two species of *Crotalaria***).

C.R. Acad. Sci. Paris **1937** : **204** : 1669–71.

The chromosome number of *Crotalaria fulva* and of *C. spinosa* determined in cells of root tips of germinating seeds was found to be 16. The course of mitosis is described.

563. Ustinova, E. I. 633.524.35:575.127.2:635.648

Interspecific hybridization in the genus *Hibiscus*.

Genetica **1937** : **19** : 356–66.

One seed capsule was obtained from two to three hundred cross-pollinations of *H. esculentus* L. and *H. manihot* L., the former being the mother in the reciprocal cross. The capsule contained 25 seeds, from which 6 F_1 plants were raised, one of them being matroclinous.

The hybrids were in the main intermediate. The intense yellow colour of the flowers of *H. manihot* was dominant and according to the illustrations the deeply divided, seven-lobed leaf of this species was dominant over the slightly three-lobed leaf of *H. esculentus*.

564. MEDWEDJEW, P. F. 633.525.1:575.42(43)
Die Selektionsmethodik der Ramie. (Methods of ramie selection).
Faserforschung 1936 : **12** : 134–41.

A collection of 90 specimens of ramie has been assembled and investigated in the U.S.S.R. (Sukhum) from various sources including China, Indochina, India, Africa, etc.
Besides *Bochmeria nivea*, examples of *B. macrophylla*, *B. elongata*, *B. platyphylla*, *B. malabarica*, *B. cylindrica* and others were included, but from the point of view of fibre quality none of these species is as valuable as *B. nivea*.
Selection was carried out for varieties with higher fibre content of the stems (15–20 per cent of the air-dried weight of the stem) high fibre quality, homogeneity of the staple metric number, higher stem yield, resistance to wind, immunity to disease, capacity for decortication and ease of mechanical harvesting. Varieties suitable for the various districts of the U.S.S.R. were also selected.
The following methods of selection were used, of which the details are given.
(1) Individual clone selection by which means it is possible to produce clone varieties in 3–5 years whose technical characters can be estimated.
(2) Inbreeding methods. These have shewn that all strains of ramie are more or less self-fertile. Incidentally wild ramie plants which differ considerably from the cultivated forms have yielded plants of great value for selection.
(3) Hybridization by means of crossing between races or by distant crosses. With the first method progress has been made with regard to improvement in fibre quality and the selection of forms shewing heterosis has given a large amount of stem, leaves and strong growth.
Crosses with Urticacious plants especially with *Urtica dioica* have been made to give cold resistant forms to extend the cultivation of ramie outside the subtropical regions.

565. SHIBUYA, T. 633.525.1:577.81:581.143.26.035.1
Studies on the change of sex expression in ramie (*Boemeria nivea* Hook. et Arn.)
J. Soc. Trop. Agric. Formosa 1937 : **9** : 214–25.

Ramie is normally monoecious, though it produces a few inflorescences combining staminate and pistillate flowers. Rattoons grown under a day-length of less than 9–10 hours produce only pistillate flowers and those grown under a day-length of over 14 hours produce only staminate flowers. Between these limits the normal monoecious plants are obtained. The change from the staminate to the pistillate is correlated with an increase in the carbon-nitrogen ratio.

566. GEHLSEN, C. A. 633.526.5
Die Faserpflanze "Caroá". (The fibre plant "Caroá").
Tropenpflanzer 1937 : **40** : 444–47.

A new fibre plant, *Neoglaziovia variegata* from Brazil belonging to the family *Bromeliaceae* and capable of being used as a substitute for jute is briefly described. Its propagation by seed presents some difficulties and methods of obtaining seed and its germination are described.

SUGAR PLANTS 633.6

567. ALCÁNTARA, M. C. 633.61:575
Sugar cane and its varieties.
Proc. 10th Annu. Conf. Asoc. Tecn. Azucareros Cuba 1936 : 193–203.

A brief account of the systematics and breeding of sugar cane, including an explanatory list of the symbols used in the numbering of varieties to indicate their origin.

568. 633.61:575(73)
633.61:608.3
Patented sugar cane varieties.
U.S. Plant Patents Nos. 203, 210, and 220 ; by B. A. Bourne, Clewiston, Fla.
Facts ab. Sug. 1937 : **32** : p. 407.

Plant patent No. 203 was developed from Louisiana Purple and Chunnee through several intervening crosses; it is early maturing, resistant to mosaic, red rot and *Helminthosporium*

and has a high sugar content. Plant patent No. 210 is a hybrid of P.O.J. 2725 and C.P. 27–108 and is early maturing and resistant to red rot, *Helminthosporium* and mosaic. It is sensitive to boron deficiency. Plant patent No. 220 is a hybrid of P.O.J. 2725 and C.P. 27–35 and is moderately early in maturity.
The varieties are minutely described and illustrated in the originals (Cf. also "Plant Breeding Abstracts", Vol. VI, Abst. 586 and Vol. VII, Absts. 1132 and 1133).

569. 633.61:575.12
633.61.00.14

Verslag der cultuurafdeeling van het proefstation voor de Java-suiker-industrie te Pasoeroean over het jaar 1936. (**Report on the Crop Section of the Experiment Station for the Java Sugar Industry at Pasoeroean for the year 1936**).
1936 : Pp. 27.

From 245 crosses of different combinations made during the year 62,294 seedlings were obtained of which over 33,000 seedlings from 199 combinations were intended for research and cytological investigation.
Selection work was also carried out on 64 estates and 233 new seedlings were compared *inter se* and with various standard varieties.
Cytological examinations of 425 different clones were made at Utrecht involving 669 drawings and of 133 clones at Pasoeroean.
Registration was sought for five new lines, G(ondang) L(ipoero) 103 and W(olter)b(eek) 4, 5, 6, and 7.

570. Yamashita, K. 633.61:576.312.35

(Chromosome numbers of some sugar-cane varieties in Formosa).
Jap. J. Genet. 1937 : **13** : 194–95.

The following diploid numbers are given: P.O.J. 2725, 2n = 107; P.O.J. 2878, 2n = 119; P.O.J. 2883, 2n = 115±.

571. Capinpin, J. M. 633.61:581.162.51:575.061.6:581.466

Anther color and male fertility in sugar cane.
Philipp. Agric. 1937 : **26** : 295–301.

Capinpin, J. M.
The color of anther of sugar cane flower as an index to its pollen fertility.
Sug. News 1937 : **18** : p. 242.

A comparison of the anther colour of 34 varieties and hybrids of sugar cane with the percentages of fertile pollen determined by means of iodine coloration of the pollen grains shewed that purple anther colour is associated with a high percentage of fertile pollen grains, as determined by the iodine test, yellow anther colour being associated with a low percentage. Varieties with purple anthers should therefore be chosen for male parents in breeding work.

572. d'Emmerez de Charmoy, D. 633.61–2.8–1.521.6:575

La lutte contre la mosaïque de la canne à sucre à la Réunion. (**The struggle against sugar cane mosaic in Réunion Island**).
Rev. Agric. Réunion 1937 : **42** : (N.S.) : 1–10.

The spread of mosaic and the damage which it causes has necessitated an intensive campaign in defence of the sugar cane.
After stringent selection P.O.J. 2878 and Co. 213, 214, 281 and 290 have been multiplied and cultivated and after three years a general decrease of mosaic is observable.
Other varieties recommended for their economic characters are briefly noted.

573. STEHLIK, V. 633.63(44)
Die wilde Rübe (*Beta maritima*) verglichen in unserem Klima mit der heutigen veredelten Zuckerrübe. [**The wild beet (*B. maritima*) compared in our climate with the modern, improved sugar beet**].
Z. Zuckerindustr. Čsl. Repub. **1937** : **61** : 236–40, 244–53.

A report on a study of wild beet (*B. maritima*) collected on the French Atlantic seaboard, on the isle of Brehat and the Department of Vendée. The general appearance of the plants in their native habitat is described.

Seeds were collected and grown at Dobrovice in comparison with a cultivated variety of sugar beet. The plants produced grew more slowly than the cultivated beet, but flowered in the first year, the inflorescence being prostrate; they were subject to infection by leaf diseases, aphids and other insects. Data are given on the economic characters; the wild material produced an average per Ar of 126 kgms. of tops, 36 kgms. of roots and 4·1 kgms. of sugar, the cultivated (Dobrovice Type N) 369 kgms. of tops, 385 kgms. roots and 70 kgms. of sugar. The amides and amino acids of the wild material were present in much greater quantity than in the cultivated, 211 mgms. as against 27.

It has been suggested that wild species may be of value in breeding, owing to the restricted parentage of the cultivated sugar beet. The author points out that the variation now present in the sugar beet, between different varieties, is very great and that in his plots of wild *B. maritima* he observed no such differences as he has seen in different progenies of isolated types of cultivated forms.

Discussing the possible applications of polyploidy, he points out that crosses between diploid and polyploid species in *Beta* are very difficult. He is sceptical also of the value of *B. lomatogona* as a parent in breeding and considers that its sugar percentage may be 8 per cent below the 30 per cent which was attributed to it by Scheibe (Cf. "Plant Breeding Abstracts", Vol. V, Abst. 391); the high amide value of the wild species has also to be considered.

574. BOUGY, E. 633.63:575.127.2:633.416
Nouvelles recherches sur les hybrides de betteraves. (**New researches on beet hybrids**).
Bull. Ass. Chim. Sucr. **1937** : **54** : 273–76.

Crosses are described between the forage variety Mangold and the sugar beet Kuhn. The sugar content of the hybrids was greater than the mean of the parents whichever way the cross was made.

The hybrids resembled mostly the sugar beet parent except in the colour of the skin which was red though the flesh was white.

STIMULANTS 633.7

575. 633.71:575(45)
BENINCASA, M. 633.71–2.42–1.521.6
Il campo di allevamento di razze di "Virginia Bright" in Città di Castello. (**Breeding Virginia Bright tobacco at Città di Castello**).
Boll. Tec. Tab. **1937** : **34** : 16–50.

In order to extend and improve the tobacco cultivation in Italy, a number of strains of Virginia Bright were tested at the experimental station at Città di Castello. As a result fifteen races have been selected which are described and illustrated, adapted to various Italian soils and climates and suitable for the requirements of the tobacco industry. A table gives their resistance to *Thielavia*.

576. COOLHAAS, C. 633.71:575(92.2)
Jaarverslag 1 Mei 1934–30 April 1935. (**Annual report 1st May 1934-30th April 1935**).
Meded. Proefst. Vorstenl. Tab. **1936** : No. 82 : Pp. 99.

Selection was continued with tobacco along the same lines as in the previous year, special attention being paid to leaf shape and fine veins, while selection for quality was also continued.

Of the Deli-Vorstenland crosses Deli x Kanari x Y 10 (DL YK) and Deli x Kanari x Kanari (DL 2K), the F_5 progeny of the latter were in general fine in quality and had very fine veins but lacked uniformity.
The work is being continued.

577. *Schweizer, J. 633.71:575(92·2)
Jaarverslag tabak over het jaar 1933 en 1934 tot de maand Juni. (**Annual report on tobacco for the years 1933 and 1934 up to June**).
Meded. Besoek. Proefst. 1934 : No. 52 : Pp. 45.

Kedoe selection is being continued on the various test plots. Pure Kedoe lines and a number of hybrids between 238 and Kedoe were raised in hopes of obtaining a plant with as many of the Kedoe characteristics as possible (i.e. a pure wrapper type) but with denser foliage to increase the yield. Selection of the Kedoe 238 hybrids has reached the F_3 stage. One line appeared very promising with dense foliage and many leaves quite of the Kedoe type and about 40 new mother plants of this number have been chosen for further selection.
The so-called Garahan Kedoe too, which has proved to be a hybrid type still segregating, exceeded expectations; and a large number of new mother plants have been selected.
Of the Kedoe selections Nos. 320 and 322, the former number was the better and especially mellower, but No. 322 was superior in burning quality as in previous years.
Hybrids.—In addition to the raising of a large number of lines of No. 343 and 344, crosses have also been made between No. 238 and shorter and broader Deli types in hopes of improving the leaf shape of No. 238. Some lines from the 343 x 344 cross have been also planted out and a number of preliminary experiments with crosses between Kedoe and Herzegowina and finally another of the well-known Vorstenlanden lines, Y_{10}.
No. 344 in particular gave as usual a dull mellow leaf, while No. 343 was more like a wild type and had therefore a somewhat more greenish leaf.
The new hybrids proved disappointing and though burning quality was good, in general, the colour and coarse quality were undesirable characters. Some good hybrids were found among the 343 x 344 cross, which is still segregating, and promising plants were retained.
The Vorstenland tobaccos gave a remarkably good product—the leaf being fine, mellow and very dark, with good burning capacity. Crossed with certain other hybrids this type of tobacco would probably be of value.
A certain amount of variation in the 344 lines is due (in the writer's opinion) to marked reaction to less favourable environment—a characteristic of these lines which might perhaps be eliminated by crossing 344 with 343.
Tests at Soekoredjo with Nos. 343, 344 and 333 (a hybrid between two Deli lines) shewed 344 to be superior under the test conditions.
Selection for burning quality.—Selection tests for burning quality were also made with Kedoe 103 and two numbers were regarded as promising for further tests.
Pre-harvest selection.—This includes the planting out of crosses of indigenous tobacco x Virginian, Kedoe x Virginian Herzegowina x Kedoe and Yellow Kedoe—five new home-grown varieties that are being tested for their suitability to produce yellow tobacco.
The "double flower" plant 238 discovered in 1932 is still segregating hybrids and normals. Such anomalous flowers are found in numbers of very different types of plants, e.g. in Kedoe, 238 hybrids and various other hybrids, including 343 and 344. In view of the fact that the majority of plants from a second sowing shewed "double flowers", the possibility of increased mutation in stored seed material having occurred is to be examined.
The F_1 plants from the cross double flower x home-grown tobacco were all normal. The F_1 plants from Gila x Hybrid 272 were practically normal; only the top shewed a trace of the "gila" abnormality; this character is thus recessive.
In line No. 375 (Kedoe x Virginian) the appendage already recorded as occurring between the main and the lateral veins of the leaf has now been definitely proved recessive.
Three tests at three different places shewed that the place of origin of the seed had no effect upon the burning property.

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* An extended summary of this paper is on file at the Bureau.

578. *Schweizer, J. 633.71:575(92.2)

Jaarverslag tabak over Juli 1934 t/m Juni 1935. **(Annual report on tobacco from July 1934-June 1935 inclusive).**

Meded. Besoek. Proefst. 1935 : No. 53 : Pp. 65.

The Kedoe lines Nos. 103 and 303.—This investigation shewed the former to be of superior quality to the latter but No. 103 shewed a very much shorter burning time, being a more mature brown in colour with less green and dun-coloured tobacco. Environmental influence on the constancy of this characteristic and on yield was noted.

Selection tests of the new Kedoe numbers. A large plot test of Nos. 103, 286, 288, 292, 303 and 305 was made. No. 103 again yielded a very dun-coloured leaf as in the previous tests at Soekowirio, while Nos. 288 and 292 were remarkably rich in colour and are to be included in the State test plots.

In other plot tests Kedoe No. 320 and 322 proved better than No. 103 (the control) in the relative percentage of leaf of desirable colour, No. 322 was also outstanding in other tests, though Kedoe 320 surpassed No. 322 by yielding a leaf with less glowing property.

Kedoe hybrid selection. Selection was continued in the 345 lines of the so-called Kedoe hybrids, crosses of the hybrid 238 with Kedoe 103, made in the hopes of obtaining a line with the true Kedoe characteristics but with a higher yield. The promising types have been isolated.

Selection of the Deli hybrids.—Tests of the new hybrid Nos. 343 and 344 were continued, hybrid 343 being divided into two lots, 343-ms I comprising lines of the less cultivated type and 343-ms II, the finer lines. Though this division was based on the external appearance of the plants in 1933, little outward difference was evident in the present year; the grading, however, shewed that the classification adopted was sound.

On Djember estate hybrid No. 344 proved clearly superior to Nos. 343 I and 343 II, both in thickness and colour and was also much duller than either of the 343 lines. On the other hand its venation is unsatisfactory. The burning property of the three lines is practically equal, though on other estates 344 proved inferior to 343.

Garahan Kedoe (a Kedoe x Herzogowina cross) and Kanari (obtained from the Vorstenlanden) were both inferior in yield to Hybrid 343 and 344. The grading analysis shews Kanari is at most only suitable for use in crosses when a darker type is desired. Garahan Kedoe turned out to be a coarse type with a high percentage of dun-coloured thick leaf.

A number of F_4 generation progenies from the 343 x 344 cross were also tested.

On the whole segregation is still going on in these plantations. Among the new plants selected, however, some had a good rich and fine leaf very like No. 344 but without its bad venation.

At Patrang hybrids Nos. 272, 343 I and II and 344 were compared and reasons are given to shew that the last two are to be regarded as the best and No. 272 as the worst.

Selection for burning property.—Three series of tests were made, two being parallel tests of Kedoe 103, to determine the effect, if any, of locality on burning property.

Two numbers, Kedoe 103-71 ms 128-56 and 103-71 ms 128-77, proved superior to the control mixture; unfortunately weather conditions interfered with the experiment, and the problem of the constancy of the genetic variation in burning property in different localities is still unsolved.

Experiments with normal and "double flower" seed exposed to a temperature of 60° C. under sunlight shewed that the percentage of double flowers was the same as in untreated seed.

Selection tests shew that lines can be isolated from a Kedoe mixture which, under the conditions of the place where the tests were made, burn better than the original mixture.

Only very slight genetic differences in burning capacity can be isolated by selection. Hence a line may be genetically relatively superior in this respect to the original mixture but from the standpoint of the absolute burning property both groups may burn badly.

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* An extended summary of this paper is on file at the Bureau.

579. SCHWEIZER, J. 633.71:575(92.2)
Jaarverslag tabak over Juli 1935 t/m Juni 1936. (**Annual report on tobacco for July 1935 to June 1936**).
Meded. Besoek. Proefst. 1936 : No. 55 : Pp. 51.

Continuation of the trials of Kedoe Nos. 103 and 303 at various centres shewed that their relative performance was markedly affected by the locality where they were grown, though in some respects Kedoe 303 proved practically consistently superior. Tests were also continued with other Kedoe numbers among which Nos. 268 and 288, 322 and especially 320 gave good results.

Three lines of Hybrid No. 345 (Hybrid 238 x Kedoe 103) were tested with Hybrids 238, 272 and Kedoe 103 as controls. Lines I and III of No. 345 fulfilled all expectations though differing slightly in their relative placing at Kertosari and Djember.

The Deli hybrid No. 343 has shewn itself adapted to cultivation in localities where hybrids had not been grown hitherto. Data are given from a number of estates where Deli hybrids are being tested.

Burning tests with strains of Kedoe 103 and Kedoe LMSA were continued. No definite conclusions could be drawn from the results but it seems clear that as regards Kedoe there is no possibility of finding a line which will burn markedly better under all circumstances than Strain 103.

Crosses of Pajacombo with a weak gila type and with a pronounced gila type and of weak gila type with the pronounced type indicated that the gila character is recessive. Only the F_1 from the last named cross was of the gila type. Though no definite conclusions could be drawn from the F_2 data, the gila character is thought to be probably polymerically conditioned.

A pure line of an "albino" variety of Virginia tobacco has been crossed with hybrids from a cross of old Virginia and indigenous tobacco with the object of obtaining types that will yield yellow tobacco under unfavourable weather conditions.

580. 633.71:575.42
ROIG, J. T. 633.71 Havanensis
Sobre la variedad del tabaco Havanensis. (**On the variety of tobacco "Havanensis"**).
Rev. Agric. Habana 1937 : **20** : No. 6 : 13–17.

The tobacco variety known as Havanensis had greatly deteriorated by 1915, it was supposed, through natural crosses with other types. An enquiry was made by the author in that year who grew seed obtained from as many growers as possible. He selected as seed parent for next year, only that plant which in the opinion of the growers approximated most closely to their conception of "Havanensis". The others were discarded and for several years selections were made, the selected seed only being distributed to the growers. It was shewn that the variety "Havanensis" is heterozygous, producing many forms which the growers had not discarded. At the present time, only selected seed is sent out to them from the Agricultural Station.

J. G. H.

581. CHABROLIN, M. 633.71 : 575. 42(61.1)
La sélection du tabac au Service Botanique et Agronomique. Amélioration de la qualité. (**The selection of tobacco by the Service Botanique et Agronomique. Improvement of the quality**).
Tunisie Agric. 1937 : **38** : 61–64.

The present scheme of the improvement of Tunisian tobacco is a new development and the first aims are improved combustibility and low percentage of nicotine. It is tentatively suggested that the results of experiments shew the favourable effect on combustibility of the substitution of potassium nitrate for manures containing chlorides or chlorates.

To reduce the nicotine content to the desired 2 per cent about twenty different varieties are being cultivated from which forms suitable for the various tobacco growing districts will be selected.

582. 633.71 : 576.312

LELIVELD, J. A. 633.71–2.484–1.521.6

Voorloopige mededeeling omtrent enkele cytologische gegevens aangaande het geslacht *Nicotiana* L. (**Preliminary communication upon some cytological data relating to the genus *Nicotiana* L.**).

Bull. Deli Proefst. Medan 1937 : No. 37 : Pp. 32.

Recent discoveries in the cytology of *Nicotiana* species, including the production of amphidiploid forms are briefly reviewed as an introduction to a preliminary report of the work that has been done in Sumatra with the Deli lines of *N. Tabacum* raised and a few other types of this species from other countries as well as forms of *N. rustica*, *N. triplex* and *N. alata*. Heterotypic metaphase was studied in flower buds and somatic divisions in root tips.

Seven of the Deli lines shewed the same configuration, namely : one large chromosome with a number of smaller ones shewing a more or less constant arrangement *inter se* and a certain amount of secondary association with fine filaments uniting the chromosomes involved. No clear division of the chromosomes into two groups of 12 could be discerned.

Two Deli lines Nos. 161 DM and 180 DM did not exhibit the same arrangement as above described, though one larger chromosome could be identified. Numerous pairs of bivalents were noted and one group of three. These two lines resemble the Cuban and White Burley types in their configurations, whilst the typical Deli forms found a counterpart in the Japanese form, Daruma, also raised at the Deli Station.

No definite conclusion could be reached as regards the constancy of the associations though a certain amount of regularity in their occurrence was observed in line A_1B_2 in which various stages of division were studied.

In line 632 no mammoth types appeared among the 30 plants raised; this may possibly have been due to the weather conditions. The haploid number of chromosomes in these plants was 24 and division was normal. Further investigations are, however, contemplated.

Six strains of *N. rustica* mainly of Asiatic and American origin all had $2n = 24$ and exhibited no abnormalities in the reduction division except in two cases in which the homeotypic division was irregular and abnormal tetrads were formed—possibly owing to the fact that the plants, which were of subtropical origin, were raised under tropical conditions.

An F_3 raised from No. 7/34/P, of Kostoff's *N. triplex* shewed very great variation in morphological features and incidentally some plants appeared to be resistant to leaf spot. Cytological examination of six plants shewed a uniform behaviour of the chromosomes at heterotypic metaphase. The chromosome complement contained 6 large, 12 medium sized and 6 small chromosomes, though Kostoff states that in his material the chromosomes could not be identified, with one exception which he interpreted as a trivalent with a single adjacent chromosome. This formation was not found in the Deli material. No aberrations were seen in the division, but secondary association was noted, though not always between the same chromosomes. About 38 per cent of the pollen was sterile as compared with about 3–5 per cent for line 8 of *N. Tabacum*, the corresponding figures given by Kostoff being 1·5 per cent and 0·1–0·5 per cent.

583. NORTHEN, H. T. 633.71:576.312.3

Studies of nuclear structure in vegetative and reproductive cells of *Nicotiana sylvestris* (n, 2n and 4n).

Amer. J. Bot. 1937 : **24** : 90–95.

The specific gravity of the nuclear sap, determined by centrifuging, is greater in somatic than in spore mother nuclei. In these latter it increases in early metaphase shewing that the lighter components have been liberated into the cytoplasm during spindle formation. In the somatic cells no such change is apparent shewing that all the nuclear sap forms the spindle. The chromosomes adhere to the nuclear membrane in all stages of the meiotic prophase but synizesis. A definite amount of nuclear sap appears to be associated with each chromosome.

J. G. H.

584. Pratassenja, G. D. 633.71:576.356.5:631.535
(Obtaining of polyploidal plants during regeneration).
Trans. Nikita Bot. Gdn., All-Union Inst. Pl. Ind., Crimean Exp. Sta., Jalta 1935 : **19** : Pp. 20.
The methods used were propagation by leaf cuttings (*Pelargonium roseum*) and by shoots induced to form from a callus at the base of a stem cutting (*Nicotiana Tabacum*). Tetraploid forms of both geranium and tobacco were obtained. Some shoots with the double chromosome number were also obtained by the second method applied to the sterile F_1 hybrid *N. rustica* (Erbasanta) x *N. Tabacum*.
The general morphological and cytological features of the amphidiploids are outlined. The tobacco tetraploid had a higher nicotine content (3·46 per cent) than the F_1 hybrid (2·6 per cent) from which it originated.
Similar work is in progress with *Ocimum* sp., *Cynanchum acutum*, *Prunus cerasus* and *Atropa Paschkewicz* Kr.

585. Povoločko, P. A. 633.71:581.162.5:535.61–31
Causes of sterility in winter-grown plants of *Nicotiana Tabacum*.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1937 : **16** : 224–26.
The sterility noted in plants of *N. Tabacum* which have been induced to flower about March was found to be due to irregularities occurring during meiosis and resulting in an irregular distribution of the chromosomes. The lack of ultra-violet rays is suggested as a cause of the phenomenon.

586. Nowotnówna, A. 633.71:581.46:575.11
Drugie pokolenie krzyżówki dwóch odmian tytoniu z gatunku *Nicotiana tabacum* L. (**The F_2 generation of the cross between two varieties of tobacco of the genus *N. Tabacum* L.**)
Mém. Inst. Polon. Écon. Rur. 1935 : **15** : 545–61.
Genetical analysis of the F_2 of the cross between two varieties of cigarette tobacco, Weisser Raeter and Tyk-Kuľak gave the following results:
The flower colour of the pink-flowered *N. Tabacum* is controlled by three factors, of which *A* allows a certain colour to appear and by itself causes a pale and pinkish-lilac colour, but in the presence of the two similar cumulative factors *B* and *C* produces a pink coloration.
For red-flowered varieties of tobacco it is necessary to assume more than two cumulative factors causing pink colour.
The pointed shape of the petals in tobacco is controlled by three cumulative factors Z_1, Z_2 and Z_3. The incision between the petals is caused by the factor *W*. The shape of the calyx is controlled by three factors, the first controls the shortening of the length of the calyx, the second only the narrowing of the calyx and the third controls the lateral incision.
In the F_2 there is a clear correlation only between the pointed shape of the petals and the size of the lateral incision.

587. Ossadtchuk, E. A. 633.71–2.42–1.521.6:575.127.2
[The immunity to the fungus (*Erysiphe cichoracearum*) and method for breeding new immune varieties of tobacco].
Trans. Nikita Bot. Gdn., All-Union Inst. Pl. Ind., Crimean Exp. Sta., Jalta 1935 : **19** : 21–58.
A large number of species, varieties and commercial types of tobacco (including some hybrids) were tested for resistance to *E. cichoracearum*.
Nicotiana Tabacum apparently contained no resistant forms; but in the "makhorka" types (*N. rustica*) immune forms were found and *N. glauca*, *N. sylvestris*, *N. alata*, *N. Sanderae*, *N. communtata* shewed only very slight susceptibility. Immunity is probably recessive in *N. sylvestris*; whereas in the crosses of *N. glutinosa* with *N. Tabacum* and the back cross to *N. Tabacum* immunity was dominant. The F_1 of *N. Tabacum* with *N. rustica*, with *N. longiflora* and *N. Sanderae* shewed no infection in the greenhouse but were sterile.

The cross of *N. sylvestris* with different varieties of *N. Tabacum* gave an F_1 resembling the susceptible parent but in F_2 a certain number of immune forms appeared.
Clearly segregation for immunity occurs, though it is a much more complicated process than the mendelian type. Apparently some gene is operating which results in the production of inviable gametes and hence in a reduction in the number of immune segregates. It seems probable also that there are several genetic factors for resistance in *N. sylvestris*.
Most of the immune segregates were self-sterile, though a few self-fertile plants did occur and combined immunity with useful economic characters; they were used as the source of material for research in 1934.

588. Roggen, M. A. van 633.72:575.42:578.08
Eenige ervaringen verkregen met het zoeken van moederboomen in theetuinen door middel van selectie-op-het-oog. (**Some findings in connexion with the choice of mother trees in tea gardens by selection by visual inspection**).
Bergcultures 1937 : **11** : 725–28.

If full advantage is to be derived from selection by visual inspection of tea trees, the following conditions must be fulfilled: a large number of trees, not too heterogeneous in type must be available as initial material; environmental conditions must be as uniform as possible; the inspection must be timed neither too soon nor too long after the last pruning; and, the existence of periodic variations in the output of the individual trees must be taken into consideration. In order to eliminate this disturbing factor of periodic variation a method in which repeated selection by visual inspection (six times) was used is described with data on the subsequent performance of the selected trees, which was highly satisfactory allowing for certain unfavourable environmental factors. It is concluded that repeated visual inspection, with proper precautions, may be used to identify suitable material for new clones with a very considerable degree of accuracy.

589. Yamashita, K. 633.72:576.312.35
(**The chromosome numbers of some species of *Thea* in Formosa**).
Agric. & Hort. Japan 1937 : **12** : 1583–84.

The chromosome numbers of two species of *Thea* and of a variety growing wild in Formosa were determined. All the plants had 30 somatic chromosomes in the cells of the root tips.

590. Roggen, M. A. van 633.72:663.95:575.42
Iets over kwalitatieve selectie in de thee. (**On selection for quality in tea**).
Bergcultures 1937 : **11** : 1094–102.

A comparison of two collections of commercial varieties of tea from Java, Sumatra, India and Ceylon, planted as seedlings at Tjinjiroean and Pasir Angin has recently shewn, after tests for aroma, flavour, colour of the dried leaf, amount of tippy leaf present and quality of the liquor produced, that the teas in the seed gardens of the Dutch East Indies exhibit exceptionally wide variation as regards quality.
In introducing new material into plantations to correct any defects of the existing types, the difficulty of combining quality and yield arises. Nursery selection for growth vigour combined, if possible, with good quality is suggested as a measure which might be attended with some success; though, again the impossibility, at the present stage of research, of selecting for quality on the basis of morphological characteristics must be admitted.
One of the best clones at Tjinjiroean as regards aroma has a moderately large leaf and is of the normal Assam type. The general belief cannot therefore be accepted as proved that superior aroma and flavour are only found in small leaved hybrid types; though the possibility exists that a higher percentage of plants of superior quality as regards aroma might be found among hybrids if a test were made.
In addition to the above-mentioned comparative study of commercial types, about 40 clones obtained from buddings of trees chosen from among selected seedling material at Tjinjiroean are being tested for quality and yield. All apparently are high yielders but vary in quality.

A number of new seed gardens have now been laid down with combinations of two or more clones (buddings) which, in addition to giving a high yield, also closely resemble each other in external features and possess outstanding hereditary characteristics as regards quality. From these and other seed gardens still to be laid down much is expected.

591. Legros, J. 633.73:575
Coffee production in the French possessions (colonies and mandate territories).
Int. Rev. Agric. 1937 : **28** : T 155–70.

Inter alia information is given on the varieties cultivated and the following points on plant breeding activities are mentioned:

On the Ivory Coast the Department of Agriculture is making crosses between the local type, *Indenia* and *Arabica* coffee. It has been suggested that an attempt should be made to obtain by hybridization two varieties similar to the coffee plant of Brazil, to be cultivated one in the forest region and the other in the Savannah district.

In Madagascar the Ivoloina station is endeavouring by selection in *Robusta* to increase the size of the bean without diminishing the productivity of the tree. Efforts have also been made to fix valuable types by inbreeding, and hybridization too is used in the breeding work. It has been suggested that selection in *Coffea congensis* might lead to the isolation of useful types.

In Tonkin, Indo-China, selection and vegetative propagation have been advocated for the improvement of varieties.

592. Schweizer, J. 633.73:575–181:581.47
Over variabiliteit en erfelijkheid van de grootte der koffieboon. (**Variability and inheritance of the size of coffee beans).**
Bergcultures 1936 : **10** : 654–61.

Since 1931 the lecturer has measured lengths and breadths of beans of Java, Robusta, Liberia and Liberia-like coffees. Various types of curves, mostly irregular, are given. The effects of different flowering times, and of picking from different parts of the tree are described. Seeds from the early harvest are smaller than from the main harvest.

More normal curves were obtained from the more uniform Robusta and Arabica types than from the segregating hybrids. The percentage irregularity is practically unchanged after some generations.

The influences of various factors connected with the nutrition of the plant are discussed, e.g. number of berries on a shoot, the length of fruit stalk, the order of ripening of clusters, the position of the cluster and so on.

Figures are given to shew the effect of altitude on bean size, e.g. for BP 42 at 1,500 feet the mean length was 16 per cent and mean breadth 13 per cent greater than at *c.* 50 feet. Beans are usually larger on young estates. A damp east monsoon in 1933 produced smaller beans. Tabulated data shew the effects of age and type of shoot, poor soil, type of stock, sun and shade, year and time of harvest, and of thinning within the cluster.

Weight, volume and specific weight are all plotted against length of bean.

The effect of climate is most important, e.g. at Kaliwining in the 1935 harvest there were more berries but less weight than in 1934. The poorer trees react more to unfavourable conditions. Some graphs demonstrate increases over the original stock of 0·7, 1·5 and 2·4 mm. for the F_1, F_2 and F_3 respectively.

It is claimed that by selection low lying estates can improve their coffee up to the standard necessary for export. L. E. M.

593. Lambers, M. Hille Ris 633.73:575.12
Koffiekruisingen als plantmateriaal. (**Coffee crosses as planting material).**
Bergcultures 1936 : **10** : 974–86.

Estate coffee already consists of crosses. Robusta sets very few seed from selfings and is really a mixture of crosses. The other kinds were crosses before introduction to the East.

The inheritance of leaf characters in a few crosses is discussed. In Robusta, three clear leaf types occur—those of Uganda, Canephora and Maragogype.
Data are given to shew that the size of the berry can be increased by crossing, in comparison with that of the mother clone seedlings. However, some crosses have smaller berries, and reciprocals differ. The cross SA 116 x 94 was made to combine the berry size of 94 with the yield of 116. For size the cross is successful.
The growth energy of the crossings has been studied and is compared by graphs with ordinary seedlings. The influence of soil variation is demonstrated. SA 56 x 109 stands out in one garden. SA 61 x 172 is more rapid than 61 or its other crosses, and SA 24 x 113 grows faster then either 24 or 113. Some strains, e.g. SA 109 and BP 42 in crosses generally gave seedlings of vigorous growth, while others e.g. SA 75b and SA 163 gave slow-growing ones. It is suggested that in general the influence of the mother may be the greater.
Yields for 1934 and 1935 are given of the early tentative crossings of 1930. The mean of 2·1 kg. berries per tree shews a 14 per cent increase over the mother tree seedlings. A greater increase is shewn when the best crossed families are compared with the best seedling families.
In 1935 twice as many new mother trees were chosen from crossed as from clone seedling families. It is likely that good results will be more certainly attained by using as parents, clones both of which have given good results.
Practical methods of obtaining crossed seed are the artificial pollination of monoclone blocks, the mixed planting of two clones, or the artificial pollination of both clones. L. E. M.

594. STOPPELAAR, J. J. DE 633.73:575.12:575.73
Wat is een goede koffieboom en hoe verkrijgt men dien ? (**What is a good coffee tree and how is it to be got ?**)
Bergcultures 1936 : **10** : 313–18.

STOPPELAAR, J. J. DE
Is er sprake van degeneratie van robusta ? (**Is there talk of the degeneration of Robusta ?**)
Bergcultures 1936 : **10** : 1160–69.

A pure Robusta type no longer exists owing to uncontrolled crossing and the variety might now almost be termed a hybrid. The trees now available possess only a very small number of valuable characters; the planting of seedlings has therefore become useless and grafting material from superior trees only should be used to establish plantations. Good material should also be sought for hybridization purposes. The planting of seedlings should be limited as far as possible to test plantations and should be under control. In selecting from hybrid material, suitable clones for experimental plantations, adaptation to soil and climate should be taken into account. Drought and eel worm resistant stocks should also be raised, various Excelsa and Quillou selections (e.g. Quillou 13 gn. 121) being recommended for trial by planters.
The value of various hybrid types of coffee e.g. Kawisari, Conuga and Arla is emphasized.
The second paper defines the term degeneration and explains in popular language the terms latent factors, intermediate characters, segregation, dominance and recessiveness.
The fact that Robusta is mainly cross-pollinated is emphasized and instances of variation and degeneration due to hybrid segregation are given. The suggested remedy for the present unsatisfactory state of Robusta is to substitute for the existing vegetatively reproduced trees, seedlings selected from the progeny of suitable crosses which have been tested for their characters. The importance of supplies of high grade seed from controlled pollination is also evident. Once superior quality seedlings have been obtained, multiplication by grafting would, of course, be permissible.

595. LAMBERS, M. HILLE RIS 633.73:575.42
Koffieselectie. (**Coffee selection**).
Bergcultures 1936 : **10** : 899–901.

The early history of development in the Malang district of coffee cultivation and selection with reference to the varieties grown and especially the Robusta and Liberia types is dealt with and the solution of the problem of the alleged degeneration of Robusta by the use of

grafted trees in conjunction with careful selection of the mother plants, culminating in the production of the best line, SA 13, that Soember Asin now possesses, is recalled.
In 1936 work was begun on the testing of the progeny of mother trees as grafts and seedlings, on hybridization and the investigation of floral biology. Ferwerda's experiments (Cf. "Plant Breeding Abstracts", Vol. III, Abst. 259) established the fact that Robusta is cross-pollinated with the result that a mixture of clones was recommended for productive plantations of grafting material. The final results of large scale tests of such material are awaited with interest.
Seed from clones has now replaced the bulked seed from seedlings but whether seedlings or grafts are more desirable as planting material still remains to be discovered and due consideration must be given to the Robusta hybrids recently produced, some of which are apparently superior as seedling material and as mother trees from which high quality clones have been obtained.

596. 633.73:575.42
U. 633.73 : 581.162.32
De selectie van *Coffea arabica*. (**Selection of *C. arabica***).
Bergcultures 1936 : **10** : 1578–79.
In this review of the pamphlet noted in "Plant Breeding Abstracts", Vol. VII, Abst. 733, the writer contests the view that self-pollination is the rule in Arabica, citing Taschdjian's data shewing that 40–90 per cent of cross-pollination has occurred in Arabica in Brazil.

597. Ferwerda, F. P. 633.73:575.42(49.2)
Gegevens der voornaamste zaaisels en cloonen verkregen uit de koffieselectie op Bangelan. (**Data on the principal seedling families and clones obtained from coffee selection at Bangelan**).
Arch. Koffiecult. Ned.-Ind. 1935 : **9** : 1–26.
The author gives a short account of the history of the very complete collection of coffees at Bangelan and of the methods of selection (started in 1907) of mother trees of seedling families and clones. Only those trees are considered with records for at least 5 to 6 years: the oldest have records for 19 years.
Short descriptions of tree, leaf and fruit characters are given for over 20 seedling families of the Robusta, Liberia and Arabica types and for over 20 clones of pure species and hybrids. Yields are tabled as kilograms per tree and per hectare. The number of trees is important as the effect of self-incompatibility is more pronounced in larger monoclone blocks.
Conuga coffee is described. At 1,800–2,500 feet it comes into production at 2 years and so can be used as a catch crop between later kinds.
Stocks are discussed. At Bangelan the best results were obtained with Conuga on Excelsa or Quillou stocks: Canephora was quite good. Details are given of the best known Bangelan stocks.
With Kawisari hybrids selfing gives as large a set of fruit as crossing, and the latter may give more spongy beans (voosboonen). Mixed planting is discussed. Tables shew the mutual compatibility between some Robusta clones and between some Conuga clones. L. E. M.

598. Lambers, M. Hille Ris 633.73:575.42(92.2)
Ontwikkelingswegen voor de koffieselectie. (**Lines of development for coffee selection**).
Bergcultures 1937 : **11** : 985–94.
Coffee improvement may be effected by sexual reproduction and controlled crosses or by vegetative reproduction and grafting. In order to obtain clones that will combine a regular standard of yield with high resistance to diseases and pests and also to unfavourable environmental factors, it is important to select plants characterized by harmonious development. In this connexion the relative advantages of selecting young or older mother trees are considered. Data are also adduced to shew that, under the same conditions, the yield of the clone and of its parent tree are similar. A Robusta tree (graft or seedling) may be regarded

as full grown at from 9–14 years from the standpoint of production and harmoniously developed trees and clones are earlier in this respect than others.
The need is mentioned for standardization of stocks by the production of suitable clones or hybrids exhibiting uniform growth such as a number of combinations with S.A. 109 which are particularly vigorous.
Among the desirable characters that can be obtained or intensified by hydridization are increased size of berry or number of berries per cluster. In the crosses of Kapakata x Canephora and Kapakata x Uganda both these aims were realized.
A further cross has now been made between Kapakata I and BP 42, to combine the berry size of BP 42 with the large number of clusters found in Kapakata. The resulting plants shew a combination of the growth habit and leaf size of the two parents.
The above-mentioned characters, with disease resistance and growth vigour, are important components of yield. As a relatively rapid method of ascertaining the productivity of certain crosses, counts of the numbers of clusters were carried out in 1936. The provisional results shewed a very marked correlation between the number of berries per cluster and the number per branch and vice versa and in the case in question the average yield per branch was determined not by the number of fruit bearing clusters but by the size of the clusters. Hence the production per tree was determined by the number of berries per cluster, the number of fruit-bearing branches and the yield and size of the beans.
Certain parents exercised a marked influence on the number of berries per cluster and also per branch. In general SA 142 and Conuga proved superior to SA 109, which gave poor results used either as the ♂ or ♀ parent. The cross between SA 109 and SA 142 is to be made this year. In one cross SA 56 x 109 a higher number of fruiting clusters per branch was obtained as compared with the cross SA 56 x 74, and the possibility of an improvement in the future yield of the first-named cross is not regarded as impossible.
The lines on which more rapid and reliable methods of estimating the number of clusters for determinations of yield could be made, are tentatively suggested.
The value of controlled crosses as a source of new and superior mother trees for the production of clones is illustrated by the highly promising trees obtained from the cross SA 56 x 74 and by an instance of one tree, with an average of 44 berries per cluster and 500 per branch, obtained from the cross SA 7 x 181.

599. SNOEP, W. 633.73:581.145:581.162:578.081
Over de bepaling van de bloeigrootte en de bloei- en vruchtslaging bij koffie. **(On the determination of the extent of flowering and the set of flowers and fruit in coffee).**
Bergcultures **1936** : **10** : 618–26.

Since the output of a plantation depends on the extent of flowering, the percentage set of fruit and the ultimate yield of fruit, the method of determining the extent of flowering and observations on flowering and fruit setting which form the subject of this paper are of importance in increasing yields of coffee.
The extent of flowering should be determined by calculating the total number of flowers produced from their total weight as reckoned on the basis of the average weight of a thousand flowers per plot of 30 trees. To allow for variation due to the site upon which the various trees grow, the number of determinations must be increased according to the number of factors operating to produce the variation.
A number of curves summarizing the data obtained from various estates in regard to flowering and fruit production are given to shew the value of such statistical material in estimating the output under various conditions.
Estimates of flowering and berry production can be used for comparative studies of the annual yield from an estate. The number of counts required for a reliable estimate will depend, as in the determination of the average number of flowers produced, upon circumstances such as individual variation, etc.
The cost of collecting the various data is estimated.

600. Ferwerda, F. P. 633.73:581.145.2:575
Gegevens over den ontwikkelingsduur der vrucht bij verschillende koffiesoorten. (**Data on the duration of the period of development of the fruit in different varieties of coffee**).
Bergcultures 1937 : **11** : 198–203.

In planning clonal mixtures composed from varieties with a markedly defined main flowering period such as Robusta clones, it is advisable to ensure that the clones included take the same time for the development of the fruit.

A study of various forms has shewn that the time required for development of the fruit is 318 days for Robusta and related forms, 313 for Conuga, 306 for Liberia-Arabica hybrids and 357 for Robusta-Excelsa hybrids. The data for forms with a sharply marked main flowering period suggest that a short development period is correlated with early ripening, and a long one with late ripening.

Numerous crosses of Robusta forms and also of Conuga forms and of the above-mentioned hybrids strongly suggest that the length of the development period is determined, not by the male parent, but by the mother plant—a condition which would seem quite probable on physiological grounds, though further confirmation is still needed for definite proof of the assumption.

601. Deenen, W. J. 633.73:581.162
Bloei en bloeislaging van de robustakoffie op Sumatra's Westkust. (**Flowering and the ultimate set in Robusta coffee on the West Coast of Sumatra**).
Doctor's Dissertation, Wageningen, 1936 : Pp. 102.

The results of a census of flowering and the set of berries on the Ophir coffee estate are recorded, with observations on the site, climate and soil and on the biology of flowering of Robusta coffee. The effects of environmental factors such as weather conditions, shade, and infestation by diseases and pests upon the set of berries are considered.

It appears that the physiological condition of the trees is of primary importance in determining the ultimate set and that the upper branches give a higher yield than the middle and lower ones, while the primary and secondary branches are practically equal in this respect.

Recommendations are made for improving conditions and the yield on the estate.

602. Lambers, M. Hille Ris 633.73:581.162.3:578.08
Bestuivingsmogelijkheden bij koffie. (**Possibilities as regards pollination of coffee**).
Bergcultures 1937 : **11** : 791–800.

The various ways in which pollination may take place in coffee are indicated and the fact that most varieties, with the exception of the arabica and the liberia-arabica hybrids, tend mainly to be cross-pollinated. The possibility of ensuring cross-pollination by insects is therefore fully discussed, with data from various sources on the effective range and activity of *Apis indica* F. in pollinating coffee and other plants. The optimum cross-pollination will be attained in a plantation in which each tree is surrounded on all sides by an interfertile variety and in such a way that the tops of the trees are close together. Moreover, the swarms of bees must be regularly distributed throughout the plantation.

The effectiveness of wind pollination is also examined as well as the results obtained by artificial pollination. By the latter method the number of defective berries (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 737) is reduced. It is shewn that an increase of 37·5 per cent in the fruit set per branch increases the weight of berries by 41 per cent and the yield of the product for the market by 43 per cent as compared with the control.

A bibliography is appended (Cf. also "Plant Breeding Abstracts", Vol. III, Abst. 710 and Vol. VII, Absts. 738 and 1334).

603. Snoep, W. 633.73–1.557:575.2:578.081
Over de variabiliteit van boomproducties bij koffie. (**On variability in the production of individual trees in coffee**).
Bergcultures 1937 : **11** : 137–44.

An analysis of data from Soember Asin shews that the individual trees can be grouped into yield classes for the period 1933–36 which on examination reveal that half of the total number of trees produced 70 per cent of the total output of the plantation (400 trees) and 30 per cent of the trees produced nearly half of the total yield.
The value of the replacement of low producers by better material is considered and it is shewn that in intensive selection work of this kind, if 30 per cent of the worst trees in the experimental plantation (which was raised from seedlings) were replaced by plants with a yield not exceeding that of the 10 per cent highest yielders in the plantation, theoretically the total output of the plantation might be increased by 47 per cent.
A study of types of annual variation in the yield per tree made with the same 400 trees shewed that there may be considerable variation in this respect.
Owing to the difficulty of eliminating such variations, which are a serious hindrance to selection work, plantations with little variation in the output per tree are desirable. Here the relative value of clones and seedling material as a means of reducing variation is considered.
Dr Hille Ris Lambers contributed some data shewing the value of the study of individual trees and their performance in selecting material for high-yielding clones.

604. 633.73–2–1.521.6:575
Schweizer, J. . 633.912:581.162.3
Kalibaroeplanters op 2-daagsche excursie in het Djembersche. (**Kalibaroe planters on a 2-day excursion to Djember**).
Bergcultures 1936 : **10** : 454–60.

Among the exhibits shewn to the visitors were Kalisan 11, a drought-resistant selection of coffee, and K.S.2, a selection with large beans, and other superior types including some graft material. It is also demonstrated that more trees per bouw could be planted with the high producing type K.S.11 than is normally the case.
Selection work with Arabica hybrids has now reached the F_3 generation, in which high-yielding forms that are resistant or immune to leaf disease have been found. Seed gardens and also clones of BP. which have already been tested twice by artificial crossing were shewn as well as the results so far obtained with a very small leaved lanang coffee with large berries.
The work in progress on rubber selection was explained and instances were pointed out in which seedlings from controlled pollination were inferior to those from open-pollinated plants, thus shewing that controlled pollination *per se* does not necessarily ensure the best results.
At the Experiment Station a device for separating large and small beans was demonstrated.

605. 633.73-2.112–1.521.6:575
Étude de lignées de caféiers à Tshibinda. (**A study of lines of coffee at Tshibinda**).
Agric. Élev. Congo Belge 1937 : **11** : 118–19.

The behaviour of lines of coffee which were being grown for observations on the heredity of green and brown shoots have been studied also for resistance to drought.
The conclusions are as follows:—
(1) Black tip disappears during the dry season and the trees which were attacked may grow taller than trees not subject to the disease.
(2) Plants suffering from Black tip are not affected by drought (mostly those with green-leafed terminal shoots BV) (Cf. "Plant Breeding Abstracts," VII, Abst. 733). Those resistant to Black tip do not always suffer from drought (mostly BB, brown-leafed shoots).
The leaf colour of the terminal is a useful though not certain indication of the yield capacity of the plant and its resistance to Black tip, Die back and drought.
The behaviour of these characters suggests that they are controlled by polymeric factors.
Some observations are also recorded on the height of the lines and the circumference of the stems. The average height of the plants before topping may be considered as a varietal character.

606. REINHOLD, F. 633.85:635.623:519.241.1
Korrelationen beim schalen- und rankenlosen Kürbis als Grundlage der Vorselektion. (**Correlations in the shell- and tendril-less marrow as bases of preliminary selection**).
Züchter 1937 : **9** : 177–80.

The correlations between percentage crude fat (oil) content of the seeds, yield of fat per plant and yield of seed per plant, as well as their correlations with eight other characters are given. The material from which the measurements were obtained was 60 fruits of the F_8 generation of the marrow with shell-less seeds and without tendrils bred by Tschermak-Seysenegg (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1332).
The shell-less form was compared in respect of the 11 characters with a segregate from the same cross with shell-enclosed seeds, to the advantage of the former.

607. 633.853.55
SCHREIBER, L. L. 633.853.55:575(47)
(The castor oil plant—based on data of official variety trials for 1929-35).
Vsesojuznaja Akademija Sel'skokhozjaistvennykh Nauk im. V.I. Lenina, Vsesojuznyi Institut Rastenievodstva Gossortoset' (Lenin Acad. Agric. Sci., All-Union Inst. Pl. Ind., Sect. for Regional Variety Trials) Leningrad 1937 : Pp. 80.

This pamphlet deals with the castor oil plant under the following aspects: the production in various countries; a brief historical account of variety trials with some mention of varieties recently produced in the U.S.S.R., notes on biological features of the plant such as varietal and species differences as regards temperature, moisture and soil requirements; drought resistance; length of vegetation period of varieties and variations observed; earliness in relation to yield; morphological features; cultural measures; quality of the seed and oil and variations in this respect and their causes; disease resistance; results of variety trials in various regions of the U.S.S.R. Finally, brief descriptions of a few of the main varieties and their origin by mass or individual selection are given with general observations on the possibility of extending the cultivation of the crop towards the north and in the north-east.
The highest yielding variety in most regions of the European part of the Union is Donskaja 172/1 bred by the Rostov Oil Station in its campaign against *Orobanche*. Kruglik 5, bred by the All-Union Institute for Oil Crops, is nearly as good. Even the best varieties, however, have many defects and the geneticist must endeavour to produce varieties characterized by the following features in addition to high yielding capacity and suitability for mechanical harvesting: earliness combined with uniform ripening of the whole crop, the absence of lateral racemes, seed capsules that do not split or shed, resistance to drought and to diseases, and easily distinguished morphological characters.
Seed certification and multiplication are to receive attention and the rapid multiplication of Tashkent 351 and of the new early variety, Šade, with non-splitting seed capsules, bred by the All-Union Institute for Oil Crops is recommended.
There is a bibliography.

608. 633.854.54:665.3:575·11
ARNY, A. C. 633.854.54–2.484–1.521.6:575
Breeding better flax varieties for Minnesota.
Proc. Minn. Acad. Sci. 1936 : No. 1458 : 29–38.

Bison is a popular variety because of its vigour, wilt resistance (*Fusarium lini*), high yield, medium large seed and high oil content, but its oil is somewhat deficient in drying quality. It was therefore crossed with Redwing and Common Pink, two varieties with high oil quality. In the third and fourth generations of the crosses determinations of oil quality (iodine number) were made and it was found that it ranged between the parental values but did not exceed them. The correlation coefficients between iodine number and 1,000-seed weight were found to be negative.

Another cross studied was Redwing x 770 B. Here there was segregation for seed colour in the ratio 3 yellow : 1 brown (apparently a misprint for 3 brown : 1 yellow) and for cilia on the false septa in the boll in the ratio of 3 ciliate : 1 smooth. If the average iodine number of the two parents was taken as dividing point there was also monohybrid segregation for oil quality, with low quality dominant. Tests for the independence of these segregations shewed that seed colour and oil quality were independent of ciliate versus smooth false septa but that high oil quality was associated with yellow seed colour (Cf. also Abst. 371). This association is ascribed to linkage, but Redwing, the parent with the higher oil quality, has brown seeds. The range of oil quality in this cross exceeded the parental range.
From the first two crosses, lines have been selected which equal or exceed Redwing in oil quality and exceed both parents in wilt resistance.
They exceed Redwing in seed weight but none of them equals Bison in this character.

609. Shcherbak, S. 633.854.78–2.452–1.521.6:575
(Breeding sunflowers for rust resistance).
Bull. Appl. Bot. Leningrad 1937 : Ser. A (21) : 67–76.

The failure of mass and individual selection in breeding sunflowers resistant to *Puccinia helianthi* is attributed to the fact that resistance is a polymerically conditioned recessive character, though Satsiperov regarded it as monomeric. The early work of the latter investigator and the author's experiments in crossing wild forms with cultivated annual species of sunflowers and tests of large numbers of geographical races shewed the prevalence of susceptibility, the only exception being *Helianthus mollis* which was not affected by rust and had a very long vegetation period. Among perennial species three proved completely immune but sterile on crossing with cultivated species.
Inbreeding with induced self-pollination was begun in 1931 and has yielded excellent results as shewn by the greatly increased resistance of a line 314 selected from Fuksinka 10 and inbred. Moreover, rust resistance has been combined with an inflorescence of normal diameter and a short and relatively slightly bent stem suitable for mechanical harvesting. Since the diameter of the floral disc has not been reduced by inbreeding multiplication can be effected without the usual preliminary crossing to restore fertility.
The question of possible physiological races of *P. helianthi* must be examined in the future.

MEDICINAL PLANTS 633.88

610. 633.885.1:575.42(92)
Kerbosch, M. G. J. M. 633.885.1–1.547.25:581.165
20 jaren bemesting en selectie in de kinacultuur. **(Twenty years of manuring and selection in the cultivation of cinchona).**
Bergcultures 1937 : 11 : 1019–30.

In the early stages of cinchona cultivation in Java from the time of the introduction of the *Ledgeriana* type, selection proceeded along two lines, (1) selection for quinine content and trueness to type, and (2) selection for characteristics of importance from the planters' standpoint, namely, vigour of growth even in less fertile soils, good branching and low susceptibility to diseases and pests. The history of these two lines of investigation is treated by considering what clones could be best recommended at three stages, 1917, 1927 and 1937.
The most important advance in testing and increasing the accuracy of comparative data on the performance of the various clones being tested was provided by the adoption of the ring method. By this means it became possible to ascertain to which components of yield—thickness of bark, high quinine content or circumference—a high output of quinine might be due in a particular instance. The data for variation that had been found to occur within a clone were shewn to be reliable and then the effects of soil factors upon a given clone could be estimated and in some cases such differences between groups of trees in a single clone could be obviated by proper manuring.

In 1926 200 clones were planted for testing in rows side by side alternating with rows of the standard clone and suitable manuring was also introduced in such plantations, though some tests were also made on unmanured soils since it is desirable that selected clones should be high producers on both good and inferior soils. Some of the 200 clones are discussed from the standpoint of their reaction to favourable and unfavourable conditions and Tjibeureum 5 proved to be a good general utility-type.

In 1937 results from the test plantations on manured and unmanured soils, the clones Tjinjiroean 1 and Tjibeureum 5 are worthy of mention, the latter having a very high quinine content. These two clones owe their superiority to different combinations of the components of yield. Both grow well also under less favourable conditions. Other clones of value are Kertamanah 63 which performs well under certain conditions, Kertamanah 241 which does well on certain types of poor soil, and Goenoeng 1 which has a number of good points.

It is thought that the use of seedlings is destined to play a considerable role in the future development of cinchona cultivation, and especially in the production of material for new clones. In this connexion high production and greater resistance to diseases and pests are the main aims. The composition of the present sources of seed from the *Ledgeriana* seed varieties is given. The first seed nursery was laid down with material from four clones K 63, Tjinjiroean 1, W 3 and RG. 1 and the new seedlings have proved superior in vigour of growth and yield of quinine per tree.

It is suggested that seedlings and grafted material both be used on plantations; the more general use of seedlings will depend on progress in selection work. Among the advantages of seedling plantations are the fact that the root bark of a seedling plantation yields 2–3 times more than that of a grafted plantation and that possible infection by fungous disease entering at the site of the wound made in grafting is obviated. From plants from the 4 clones mentioned and from other seed nurseries about 600 different clones are now being tested.

RUBBER PLANTS 633.91

611. 633.912:575.42(92.2)

Hoedt, Th. G. E. 633.72:575.42:663.95(92.2)

Enkele werkzaamheden van het Proefstation West-Java in het afgeloopen jaar, in het bijzonder met betrekking tot de rubbercultuur. (**Some of the activities of the West Java Experiment Station in the past year, with special reference to rubber cultivation**).

Bergcultures **1937** : **11** : 1325–36.

This paper contains *inter alia* an account of what has been done by the Station in regard to vegetative, sexual and mass selection with rubber. That valuable clones have been developed is evidenced by the work of Vollema, Maas and others; while the test plantation at Tjiomas indicates that by the use of seed raised from combinations of superior clones, seedlings with high yields can be obtained.

Among the most promising of the plantings raised from seedlings from controlled pollinations are the combinations TjI x TjXVI; TjXVI x TjI; Pr. 103 x Pr. 105; Pr. 103 x 106 and Pr. 103 x 107 which have given indications of high yields.

Investigations have recently been undertaken on a number of estates to find out whether artificial pollination could be employed in obtaining the necessary quantity of high grade seed from tested trees even though the set resulting from this method is only about 4 per cent. In view of the difficulties involved in it, however, the method cannot at the present stage be recommended for general use.

Cramer's method of selecting young rubber plants on the basis of their latex flow in a test tapping made with his specially devised knife has proved to be a satisfactory criterion of the subsequent performance of the trees and can be used in mass selection for improved yield.

A brief account is given of the development leading to the adoption of vegetative selection research on tea and the necessity for attention to quality and the problems of the interaction between scion and stock is emphasized. A major difficulty in selecting for quality is the fact that definite information on the basic criteria of quality is still lacking.

612. Ostendorf, F. W. 633.912:581.165
Beschouwingen over rubber-plantmateriaal. (**Views on rubber for planting**).
Bergcultures **1936** : **10** : 520–26.

In this survey of recent *Hevea* selection work, with special reference to the advisory information given to planters, the origin of selected or cross bred clones obtained from budding and the work of the experiment stations in collecting data on the older existing clones is mentioned. Only recently has it been possible to base the recommendation of different clones on the requirements of different localities. In this connexion the probable influence of the scion on the stock is considered. Though from the available data it is not possible in general to recommend certain clones for dry or wet land, still there is evidence as regards disease and wind damage that certain clones such as BD 5 and Tjir I are markedly susceptible. Studies of regional adaptation must be extended. The possible importance of the choice of suitable seedlings as stocks with reference to their influence on the growth and productivity of the scions has recently been recognized as a problem of practical significance, though the conflicting results so far obtained do not admit of definite conclusions being drawn and any advice given on the choice of stocks can only indicate lines on which success is likely, though not certain, to be attained.

The present position as regards the relative value of seedlings and clones has been summarized by D'Angremond (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 1341).

Experimental data obtained from clones in which mother trees and buddings were derived from one seedling would seem to indicate that by the use of suitable stocks the differences between a clone and the mother tree can be greatly reduced, thus increasing the value of selection for superior clones.

FRUIT TREES 634

613. Kovalev, N. V. 634(5+47)
(**Fruit and berries of the Far East**).
Priroda (Nature) **1937** : No. 2 : 82–93.

In view of the severity of the climate of the Far East Region which precludes the cultivation of European varieties of fruit crops in most of that area, a survey has been made of its abundant natural resources of fruits, berries and nuts growing wild or cultivated (or partly so) in various regions. Many of the apricots, pears, plums, cherries, etc., whose occurrence and characteristics are described, are of importance mainly because of their potential value as breeding material or for use in hydridization in the production of highly frost-resistant types for the Far East, and for Siberia and Northern Europe too. The following forms are worthy of mention:—

Prunus ussuriensis, forms of which display great variation in the shape and colour of their fruits and leaves as well as in their adaptation to severe climatic conditions. In the Far East this species flowers rather late and comes into bearing early as well as being exceptionally hardy. The fruit is satisfactory in quality though small in size. In view of its very high yield *P. ussuriensis* should be useful for the Far East, western Siberia and the Altai region. The small size of the fruits and bitter taste of the skin in some forms could be eliminated by breeding. The production by N. N. Tikhonov of a number of successful frost-resistant plums from local varieties in the Ussuri region and by hybridization with *P. ussuriensis* is mentioned. The species has 2n = 16 chromosomes and crosses with Japanese and American species as well as with *P. cerasifera*.

Both wild and cultivated forms of apricots comprising frost-resistant types are found. Among the latter may be mentioned *Armeniaca mandshurica* and *A. siberica*. *A. Davidiana* and many hybrids of these three species with wild or with cultivated forms such as *A. ansu* and *A. vulgaris* also occur. All can be crossed easily *inter se* so that it should be possible to improve the quality of the fruit not only for the Far East but also for cultivation further north.

Numerous cultivated varieties of pears exist in various districts but the keeping quality of some is poor though their quality is otherwise good. It seems probable that the varieties of the Far East may contain traces of the wild *Pirus ussuriensis* or *P. ovoidea*. In general the

former species is suitable for eating only after long storage and forms that can be used fresh are rare; but it can withstand —50° of frost and has been used by Michurin and Tikhonov to produce winter-hardy forms. Other varieties obtained by Lukačev do not suffer from scab, possibly owing to hybridization with *P. ovoidea* which is also free from it. Lukačev's varieties might be used with advantage in crosses with *P. ussuriensis*. A considerable amount of selection of local forms has been done at the Ussuri Station by raising them from seed and other means. In the southern part of the Ussuri district varieties of *P. serotina* have been found and though less winter-hardy than the foregoing types they have been used in crosses with European species by Michurin and Tikhonov.

The apples of the Far East Region are represented by the species *Malus sibirica* and *M. mandshurica*, both of which are found wild over a fairly large area and are extremely winter-hardy. There is great variation in the form and colour of the fruits which are, however, of small size in both species. Numerous hybrids of *M. sibirica* are also found. Both species should be of value for breeding purposes.

As regards cherries for the Far East Region, it is suggested that new varieties could be obtained by crossing wild and cultivated European forms and also by cultivating species from Japan (e.g. *Cerasus tomentosa*) and Northern China. *C. tomentosa* is not only winter-hardy but also tolerant of excessive soil moisture and a humid climate such as that of the Far East. Tikhonov has succeeded in producing a number of varieties that are frost-resistant and have moderately large fruits and a good flavour combined with high-yielding capacity; while the All-Union Institute of Plant Industry has also obtained hybrids of *C. tomentosa* with the European wild plum. *C. japonica* has also been crossed by Tikhonov with *C. humilis* to obtain hybrids with sweet fruits. *C. Maximoviczi, C. glandulifolia* and the Sakhalinskaja species (which all have n = 8 chromosomes) are regarded as promising material for breeding purposes.

Only one vine *Vitis amurensis* is recorded in the Far East Region, where it extends very far north and is widely distributed. It exhibits much variation, but is very hardy. Tikhonov has found forms with a large fruit, and also hybrids have been produced by him and other workers by crossing the vine of the Far East Region with the European vine, thereby obtaining a less hardy type with only slightly larger fruits but with greatly improved flavour. Under warmer conditions *V. amurensis* shews an increased sugar content.

Of three species of *Actinidia* found in the Far East Region two are edible namely *A. kolomicta* and *A. arguta*. Both species are described. Their fruits are palatable and have a high vitamin content. It is suggested that *A. chinensis*, a Chinese form with relatively large fruits could be crossed with the more northerly forms to increase the size of their fruits.

Schizandra, which grows in the Ussuri district and is used by the inhabitants as a substitute for lemons and as a source of citric acid which is obtained from the bark, is also mentioned as of economic value.

The nut trees of the Far East are represented by *Juglans mandshurica*, three species of *Corylus* and the "Korean cedar". *Corylus heterophylla* could be cultivated and used for crossing with superior European varieties. *J. mandshurica* is very frost resistant, edible and contains much oil but has such a hard and thick shell that the yield of oil is seldom over 15–18 per cent. The possibility of crossing *J. mandshurica* with *J. regia* to produce types more suitable for the north is considered. This hybrid has already been obtained by Michurin and Tikhonov. Crosses should also be made with forms from northern China (*J. sinensis*) and other more cold-resistant forms.

Among the berries found in the Far East Region *Ribes procumbens*, which is found in the northern area and in Eastern Siberia, stands 50° of frost and has moderately large berries and a very sweet flavour, grows deeply covered in moss (only one third of the plant being above ground) and is obviously adapted for cultivation in the extreme north. Other berry fruits with valuable characteristics (including cold resistance) which could be used in breeding are the Pal'čevskaja currant and the Manchurian currant. The latter comprises some forms which bear fruit in October and have berries which adhere firmly to the bunch; the yield is extremely high though the fruit is coarse and not very palatable. Another promising form is *R. triste* which has rather large and palatable berries.

Favorskaja's work with the Eastern Siberian currant and the hybrid Primorskii Champion, a cross of a European variety with the wild *R. discusha* of Eastern Siberia is mentioned. In

the F_2 and F_3 Primorskii Champion has yielded excellent varieties with firmly adhering fruits and other desirable features. These varieties with other hybrid forms that have been produced have solved the problem of finding a frost-resistant black currant for the whole of the Far East region up to 50–52° latitude.
The most cold-resistant gooseberry in the world, the Bureinsk gooseberry, is found in the Far East. It has small fruits and stiff bristles, but is sweet and apparently not infected by *Sphaerotheca* and could be used in breeding.
The strawberry indigenous to the region is *Fragaria orientalis*, a bi-sexual form which is wide-spread and stands cold. The fruits are highly aromatic and palatable. A form with large fruits has been found and is now cultivated. The species is said to cross with the European stawberry.
Lonicera edulis is found in great variety as regards the size, shape and flavour of the fruit. It is used for jam making. It ripens at the beginning of June and would therefore be useful for cultivation in the north.
The utilization of this abundant material has been begun and should result in the breeding of useful cultivated forms for Siberia, the Urals and northern Europe.

614. 634:575

Plant improvement.
Amer. Nurserym. 1937 : **65** : No. 5 : p. 9.

Extracted from a talk by Professor A. Laurie, this brief note mentions first the technique of crossing and then recent tendencies in improvement. In apples these include changes in the fruiting period and disease resistance, in grapes increased sugar content.

615. 634:575(47)
634.7:575(47)

Lisavenko, M. A.

(Breeding fruits and berries in the Altai region).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1936 : No. 12 : p. 11.

At the Altai sub-station (established in 1934) 806 varieties of apples, strawberries, gooseberries and other fruits are being studied. Many are undergoing variety trials and 42,000 grafts of apple trees have been carried out. Much attention is being devoted to the study of wild types with a view to the selection of the best species and forms and their subsequent use in breeding.
A cross of the wild species *Fragaria orientalis* from the Far East Region with *F. grandiflora*, which has large fruits, yielded over 50,000 seeds from which seedlings are being raised. Crosses have also been made (by Michurin's method) between the apple and the so-called "Reinette" derived from the Siberian wild apple.

616. 634:575(47)
634.23:575.127.2

Sjubarov, A. E.

(Breeding fruits and berries in White Russia).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1936 : No. 12 : 12–14.

In order to improve and increase the numbers of varieties available for the region in question a study of the main types of apples, pears, plums and cherries is being made by breeders, whose programme shews the importance attached to cold resistance and earliness. Michurin's technique is being used and material is being drawn from wild and cultivated forms from about 50 countries. Selection of local forms, inbreeding and hybridization have yielded satisfactory results. Over 500 combinations have been made and about 20,000 hybrid seedlings obtained and are being tested for winter-hardiness and immunity. Among these hybrid forms are *Prunus tomentosa* x *P. maritima* and seedlings derived from reciprocal crosses between the sweet and the sour cherry.

617. Tikhonov, N. N. 634:575(47)
(Improving the recognized collection of fruits in the Far East Region).
Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1936 : No. 12 : p. 14.
An annotated list of the new forms and varieties of plums, cherries, pears, vines, blackberries and strawberries, obtained by interspecific hybridization or by selection of superior local and wild types or introduced from other countries. Several of the new productions are frost resistant.

618. Hansen, N. E. 634:575(78.3)
Fruits, old and new and northern plant novelties.
Bull. S. Dak. Agric. Exp. Sta. 1937 : No. 309 : Pp. 16.
In addition to lists of varieties of fruits recommended for South Dakota, this bulletin gives notes on new varieties of the following fruits bred at the South Dakota Experiment Station: apples, crab-apples, pears, plums, cherries, cherry plums (cherry-plum hybrids), apricots, grapes, black currants and gooseberries.

619. Kedrin, S. P. 634:575:007(47)
(Methods of breeding and achievements of the experimental horticulturist M. F. Kopylov).
Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods. Bull Lenin Acad. Agric., Sci. Res. Inst. Fruit Grow. I. V. Michurin) 1937 : No. 1 : 81–89.
This article containing numerous citations from the late M. F. Kopylov's unpublished notes reflects his views on stocks, with special reference to the importance of hardy dwarf types, on the production of a hardy vine suitable for large-scale cultivation in districts of the U.S.S.R. by hydridization of the European and the *ussuriensis* types of vine, on the selection of suitable parent forms for breeding purposes and the importance of climatic adaptation obtainable through hybridization, and on the rearing, care and selection of hybrids. Kopylov learned and used the methods of Michurin with whom he maintained constant relations in his work. Numerous suggestions of Kopylov for the production of new forms of various fruits and a descriptive list of the varieties of apples which he produced is given with notes on their origin, when known, their hardiness and other economically valuable features.

620. 634:575.252
Plant hunting at home for fruit growers.
J. N.Y. Bot. Gdn. 1937 : **38** : 233–34.
A note on the search for superior bud mutations suggested by Shamel and Pomeroy (Cf. "Plant Breeding Abstracts", Vol. VI, Absts. 1004, 1384 and VII, Abst. 1037).

621. Stuivenberg, J. H. M. van 634:581.162.3:581.162.5
Bestuivingsproblemen bij onze ooftgewassen. **(Pollination problems relating to our fruit trees).**
Fruitteelt 1937 : **27** : 203–24.
A report of a lecture read during the Agricultural Week at Wageningen and dealing with the effects of nutrition upon germination of pollen and the significance of differences in chromosome number in crosses in various types of fruit with special reference to problems of intersterility.

622. Berkut, O. D. 634.11:575.127.5:634.13:581.331.2
(Breeding apple x pear hybrids).
Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods. Bull. Lenin Acad. Agric., Sci. Res. Inst. Fruit Grow. I. V. Michurin) 1937 : No. 1 : 22–24.
Pollination of 5,785 apple blossoms with pear pollen gave 74 fruits from which 318 seeds were obtained of which 21 per cent. produced seedlings. Some subsequent stages of growth of these seedlings and others similarly obtained are briefly outlined. Some of the hybrids definitely resembled the pear parent. The experiment is regarded as still another instance of the value of Michurin's pollen mixture technique.

623. STUTERHEIM, W. 634.11:575.183
Invloed van het stuifmeel? (**Influence of the pollen ?**)
Fruitteelt 1937 : **27** : 170–73.

Bos, J.
Invloed van het stuifmeel? (**Influence of the pollen ?**)
Fruitteelt 1937 : **27** : 195–97.

Two further papers in which various arguments for and against the occurrence of xenia are considered in relation to the evidence advanced in the article reviewed in "Plant Breeding Abstracts", Vol. VII, Abst. 1040.

624. DERMEN, H. 634.11:576.356.5:581.162.3:576.312.35
Fertilization in the Baldwin apple, a triploid variety.
J. Arnold Arbor. 1936 : **18** : 106–08.

The distribution of chromosome numbers in cells from the root tips of germinating seeds was found to range between 35 and 61, the class with 40 chromosomes being the highest. Six seeds (not included in the general table) had 53, 57, 58, 59, 62 and 65 chromosomes. The data are taken to indicate that the seeds are the result of open-pollination. The six seeds with the high chromosome number are assumed to be due to irregularities in the reduction division and not to fertilization by another triploid variety.

625. DERMEN, H. 634.11:576.356.5:581.163
Aposporic parthenogenesis in a triploid apple, *Malus hupehensis*.
J. Arnold Arbor. 1936 : **18** : 90–105.

As *Malus hupehensis*, a triploid apple (3n = 51), always sets abundant seed the cause of this phenomenon was cytologically examined. It was found that in the ovules embryo sacs are formed probably entirely by means of apospory. The polyembryony observed was associated with the development of complex embryo sacs.

Evidence is given for the assumption that *M. hupehensis* is of hybrid origin and it is suggested that the phenomenon described may be due to a physiological change brought about by triploidy which accelerates vegetative growth and has an inhibitory effect on sexual development.

626. RUDLOFF, C. F. and
SCHANDERL, H. 634.11:581.162.5
Befruchtungsbiologische Studien an Äpfeln. (**Pollination studies with apples**).
Gartenbauwiss. 1937 : **11** : 251–71.

Out of 219 varieties of apples tested in pollination experiments 58 have proved bad, and 161 good pollinators. The results of pollen germination tests are shewn in two lists of varieties graded as giving 0–30 per cent and 34–100 per cent germination, the chromosome numbers being indicated where known.

The results of the pollinations carried out on 147 varieties during the past six years at Müncheberg and Geisenheim and involving 174,562 individual flowers are also recorded. Out of 143 varieties mostly selfed for several years in succession 141 proved almost completely sterile. Of the exceptions Weidner's Goldrenette and Carpentin, the latter only seems to have been definitely self-fertile in some years while in the case of the former the possibility of apogamy cannot yet be excluded.

Four new intersterility groups were discovered namely, Reinette du Canada x Calville blanche d'hiver, Reinette du Canada x Goldparmäne, Blenheim Orange x Goldparmäne and Belle de Boskoop x Transparent aus Croncels. It is worthy of note that in these combinations the female parent is most frequently triploid and the question arises as to whether triploids are more frequently involved than diploids in cases of intersterility.

Other combinations under observation as possibly intersterile are Adams Pearmain x Goldparmäne; Gelber Bellefleur x Cox's Orange and Weidner's Goldrenette x Goldparmäne.

The tabulated results of tests of seven varieties known to be good pollinators in which each was used on large numbers of different varieties shewed that it is highly unlikely that a universal pollinator will be discovered.

627. Leonoff, I. M. 634.11–2.111–1.521.6:578.081
(An experiment in applying biometrical analysis of the apple tree under conditions of Siberia).
Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods. Bull. Lenin Acad. Agric., Sci. Res. Inst. Fruit Grow. I. V. Michurin) 1937 : No. 1 : 64–70.

A more rapid method of determining the frost resistance of apples has been devised from a biometrical analysis of the phenological phases of development in relation to frost resistance in Siberian apples.

In sixteen varieties observed no correlation was found between the time when autumn colouring is assumed or the onset of the fall of the leaves and frost resistance and only a very weak correlation was found between frost resistance and the date of termination of the vegetation period (i.e. the end of leaf fall).

On the other hand there was a marked correlation in 22 varieties between early onset of the vegetation period and frost resistance, and a similar correlation was found as regards early flowering. Moreover, varieties with a vegetation period that began early also came into bearing from 1-3 years sooner than varieties with a vegetation period that was late in beginning. Pubescence of the leaves and branches was found to be negatively correlated with frost resistance and the same relationship held between early onset of vegetation period and fruit size, while varieties with a "late" vegetation period had relatively larger fruits and more pronounced pubescence of the leaves.

The desirable characters among the above are to be combined by breeding operations aiming at the production of suitable types of apples for cultivation in Siberia.

628. Vanin, I. I. 634.11–2.42–1.521.6
(Studies on the apple varieties susceptible to the apple scab (*Venturia inaequalis*) in the Voronezh and Kursk Provinces and in the south-eastern part of the Moscow Province).
Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods. Bull. Lenin. Acad. Agric., Sci. Res. Inst. Fruit Grow. I. V. Michurin) 1937 : No. 1 : 71–76.

Observations from 1933 to 1935 shewed that there are varietal differences in the degree of resistance of apples to scab and that no immune varieties exist in various districts of the U.S.S.R. The resistant, moderately susceptible and highly susceptible varieties are enumerated.

629. Mozgovoy, Ju. G. 634.11–2.7–1.521.6:581.4
[The immunity of apple trees to the woolly aphis (*Eriosoma lanigerum* Hausm.)]
Bull. Appl. Bot. Leningrad 1937 : Ser. II (11) : 107–51.

This article deals with the main body of existing information on the woolly aphis derived from investigations in various countries. The following aspects of the subject are surveyed with copious citations from relevant literature:—Races and specialization of the pest; resistance of varieties and species of apples (with tabulated results from various countries including Russia); immunity and environment; pathological changes in the tissues of infected fruits; the inheritance of immunity; the causes of immunity and the value of wild forms as a basis for the production of resistant types.

Some original research by the Immunity Section of the Institute of Plant Industry is mentioned in connexion with Staniland's studies of the causes of immunity. Unfortunately, however, in the Russian experiments, no constant correlation could be established between the amount of sclerenchyma tissue present in the branches of apple trees and frost resistance and this problem, like that of the specialization of the parasite, needs further investigation. The Plant Breeding Institute has selected a number of resistant forms of *Malus silvestris* and some wild Caucasian forms which might serve as initial material for breeding varieties immune to woolly aphis.

The bibliography includes some Russian papers.

630. LEENDERTZ, C. 634.13:001.4
Peren waarvan de namen aanleiding tot verwarring geven. (**Pears of which the names give rise to confusion**).
Fruitteelt 1937 : **27** : 176–77.
On the identity of a number of pears which have one or more synonyms.

631. SCHANDERL, H. 634.13:581.162.5
Befruchtungsbiologische Studien an Birnen. (**Pollination studies with pears**).
Gartenbauwiss. 1937 : **11** : 297–318.
Tests of 198 varieties of pears shewed that 41 produced pollen of low germinating capacity. The results of pollination of 80,910 flowers in self- and inter-sterility tests are tabulated in condensed form. Selfings three years in succession shewed that 122 varieties were practically self-sterile and of these only two varieties, Esperens Bergamotte and Nouveau Poiteau gave regularly satisfactory yields of normally formed fruits after selfing i.e. as a result of parthenocarpy. This phenomenon was also noted in other varieties but the fruits obtained in these cases were for various reasons of no economic value.
The intersterility believed to exist between Gute Louise and Williams Bon Chretien was confirmed by crosses of the former by the latter; in the reciprocal cross a set of 6·7 seeds per fruit was obtained in 1934. The combination Williams Bon Chretien x Frühe aus Trevoux is probably also sterile.
Tests of 6 varieties each used as pollinators for large numbers of other varieties revealed no "universal pollinator".
Napoleons Butterbirne only sets fruit as a result of parthenocarpy following stimulation by foreign pollen, being sterile with its own pollen. The variety Jeanne d'Arc is peculiar in that its flowers fail to open completely and only insect pollination can therefore be effective.

632. HSIONG, S. L. and
HILDEBRAND, E. M. 634.13–2.3–1.521.6:575
Maternal inheritance in pears.
Phytopathology 1937 : **27** : 861–62.
A somewhat fuller account of the work already reviewed (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1358).

633. VENIAMINOFF, A. N. 634.22 –2.111–1.521.6:575.127(47)
(**New plum varieties for fruit industry**).
Za Mičurinskoe Plodovodstvo (Horticulture by Michurin's methods. Bull. Lenin Acad. Agric., Sci. Res. Inst. Fruit Grow. I. V. Michurin) 1937 : No. 1 : 10–21.
An economic survey is given of the main characteristics of the species and varieties of plums found in the northern and central parts of the U.S.S.R. with frequent references to Michurin's achievements and the work of Kovalev and Kostina. Plum cultivation in these regions is not highly developed and only a few of the varieties grown belong to the species *Prunus domestica* or its hybrid forms. Moreover, though frost resistant to a considerable degree and productive, the standard varieties are deficient in quality.
Among the forms that could be introduced for the severe conditions of the central and northern zones are: *P. ussuriensis*, *P. americana*, *P. nigra* and hybrids of the last two with *P. salicina*. *P. americana* and its hybrids with *P. salicina* are thought to be specially valuable for cultivation and for hybridization work.
The varieties of *Cerasus besseyi* x *P. americana* and *C. besseyi* x *P. salicina* are early and shew high yields combined with exceptional winter-hardiness but the quality of their fruits is mediocre; they could, however, be used in the central zone in breeding early varieties with larger fruits (Cf. "Plant Breeding Abstracts", Vol. VII, Absts. 273 and 1043; Vol. VIII, Absts. 234 and 612).

634. PRYWER, C. 634.23:576.312:575.127.2
Badania cytologiczne nad niektóremi gatunkami rodzaju *Prunus*. (**Cytological studies of some species of the genus *Prunus***).
Acta Soc. Bot. Polon. 1936 : **13** : 51–83.
Cytological investigations were made on varieties of *P. avium*, *P. cerasus* and of the hybrids of *P. cerasus* x *P. avium* Queen Hortense and May Duke.
In *P. avium* the chromosome number was found to be 2n = 16 and meiosis was normal with the rare occurrence of giant pollen grains.
P. cerasus had the tetraploid number 2n = 32 and during meiosis, which shewed slight irregularities, 1–4 quadrivalents and occasionally trivalents and univalents were observed. Giant pollen grains were sometimes formed. From a discussion of the origin of *P. cerasus* the conclusion is reached that *P. cerasus* is an allotetraploid that has arisen through the hybridization of two diploid species followed by a doubling of the genoms.
The Duke cherries, putative hybrids of *P. cerasus* x *P. avium*, are in morphological characters intermediate between the parents but cytologically they are tetraploid with 2n = 32. The work of the author confirms their hybrid origin.

635. DORSEY, M. J. 634.25(73)
New peach varieties.
Trans Ill. Hort. Soc. 1936 : **61** : 241–46.
The characteristics of the newer American peach varieties are discussed, with special reference to hardiness, earliness and fruit quality. The most promising new varieties for Illinois growers are Golden Jubilee, Hale Haven, Canadian Queen, Markberta, Gage, Hardee, Cankoka and Mark Late, though Elberta is likely to remain the most important variety.

636. 634.25:575
MORETTINI, A. 634.25 Morettini 1 and 2
Ricerche per la creazione di nuovi tipi di peschi mediante l'incrocio. Due nuove varietà precoci. (**Researches on the creation of new types of peaches by hybridization. Two new early varieties**).
Ital. Agric. 1937 : **74** : 617–28.
Crosses were made between the two early peach varieties Superba and Mayflower to increase the number of early-ripening forms. From among the progeny two forms are described, named Morettini 1 and 2. Morettini 1 which ripens at Florence between June 9–16 is a good-yielding, self-fertile variety, resistant to fungous diseases.
Morettini 2, a later form ripening about July 3–10, is also, as far as can be judged at present, a satisfactory form. The need for the introduction of new forms for breeding purposes is discussed.

CITRUS FRUITS 634.3

637. 634.3:575.127.5
(**Michurin Exhibition at the Batum Botanical Garden**).
Soviet Subtropics 1937 : No. 1 (29) : p. 113.
Citrus hybrids of lemons, oranges, mandarins, pomelos, kumquats, etc. obtained by Michurin's method were exhibited. From the lemon pollinated by the wild frost-resistant form, *Poncirus trifoliata*, plants were obtained differing from the parents in morphological characters and having a single large leaf blade and two stipules.
In 1936, 5,000 crosses were made of *P. trifoliata* with the lemon and of the lemon with kumquat characterized by frost resistance and complete winter dormancy.
Much work on grafting has also been done.

638. WONG, K. C. 634.3:582
The systematic study of citrus fruit in Kuangtung.
J. Agric. Ass. China 1934 : No. 123 : 28–47.
The author reviews the literature regarding the classification of 21 species which included 139 varieties of citrus fruit of the province of Kuangtung. Their nomenclature had not

been standardized. Little work had been done concerning the botanic classification. Some forms, therefore, and especially the varieties, had not been properly named in accordance with their genetic peculiarities. In some cases different names had been applied to the same individual and in others the same name had been applied to different individuals.
The detailed morphology and physiology of *C. sinensis*, Osbeck, var. nov. Tatincheng, *C. chachiensis*, ex Hort. and var. nov. Wagner, var. myerslemon and var. nov. hunglemon of *C. limonia* Osbeck, are described. T. C. C.

639. 634.31:575.257:634.33
CASELLA, D. 634.31:575.257
Un ibrido d'innesto melangololimetta e l'apiatura dell'arancio Ovale.
(A graft hybrid of the bitter orange with the sweet lime and the "apiatura" of the "Ovale" orange).
Ann. Staz. Frutt. Agrum. Acireale **1935** : **2** : (N.S.) : 157–63.
A graft hybrid of the sweet lime on the bitter orange is described. The tree produced branches bearing oranges, sweet limes and fruit with sectors of both. The so-called "apiatura" of the "Ovale" orange when the trees produce branches bearing fruits of the variety "Biondo nostrale comune" and fruits with sectors of both varieties is thought to indicate that the original tree was a graft hybrid.
Cutting out the branches with the mixed fruits is suggested as a remedy.

640. 634.334–2.111–1.521.6:575
Possibility of frost resistant lemon.
Hadar **1937** : **10** : p. 134.
G. P. Weldon, of Ontario, California has taken buds for propagation from trees which shewed little injury in frosts when surrounding trees were severely damaged, in the hope of developing a cold-resistant strain of lemons.

NUTS 634.5

641. SCHUSTER, C. E. 634.511:575.127.2:634.512:575.125
Differences in heterosis of walnut hybrids.
J. Hered. **1937** : **28** : 216–17.
Two groups of *Juglans regia* x *J. nigra* hybrids were obtained, the *J. nigra* parent being in one case the variety Stabler and in the other a tree from the Williamette valley of Oregon. The hybrids with Stabler as male parent were vigorous and the others were not.

642. SIMONOV, I. 634.54:581.162:575.127.2
(Breeding hazels).
Sotsialističeskaja Rekonstruktsija Sel'skogo Khozjaistva (Socialist Reconstruction of Agriculture) **1937** : No. 5 : **170–76.**
The existing resources of wild and cultivated forms of hazel nuts in the U.S.S.R. are to be developed, selection work initiated and crosses between local and cultivated southern forms are to be made.
The author has studied the biology of flowering in three trees of four species, namely *Corylus avellana* L., *C. Mandshurica*, *C. rostrata* Ait, and in the species *C. colurna* L. with a view to ultimate hybridization. Instances of protandry and protogyny and simultaneous flowering of the male and female types of inflorescence are recorded as well as an unexplained case of protandry in one year followed by simultaneous flowering in the next year, which occurred in *C. Mandshurica.*
In all three species the formation of the catkins began at the same time as that of the leaf and fruit buds. Specific differences were also noted in the times when the foliage began to appear.
A method of obviating the difficulties in crossing due to differences in the time of flowering of northern and southern forms was devised. Branches of the pollen parent were gathered with immature catkins and were kept alive until the female parent flowered, when maturation of the pollen was induced by suitable conditions of temperature and nutrition.

Interspecific crosses made in 1935 with mature pollen and involving 7 species and the pollination of 2,000 flowers gave a set ranging from 59–19 per cent, while in another lot of crosses in 1936 involving 8 species gave an average set of 21·2 per cent. The 1935 crosses have yielded 60 plants.
About 3,000 crosses of species and varieties are contemplated for 1937 and some grafts are to be made to discover the form which yields best.

PALMACEOUS AND OTHER FRUITS 634.6

643. 634.61:581.48:575.11
TORRES, J. P. 634.61:575.183
Some notes on makapuno coconut and its inheritance.
Philipp. J. Agric. **1937** : **8** : 27–40.
Certain coconut palms yield a proportion of nuts in which the "meat" almost fills the shell. These nuts, known as makapuno (= filled) nuts are 15 to 20 times more valuable than the ordinary nuts. They cannot be used for seed as they do not germinate.
The proportion of makapuno nuts on makapuno-bearing trees, with uncontrolled pollination, was found to be about one quarter. Commercial plantations have been raised from seed obtained from makapuno-bearing trees and in these plantations the proportion of makapuno-bearing trees is one-third. It is clear, therefore, that the makapuno character is due to a single recessive factor, *m*, the makapuno-bearing trees being heterozygous, *Mm*. The proportion of makapuno nuts is reduced by cross-pollination if the foreign pollen comes from normal-bearing trees (*MM*).
To increase makapuno production the author suggests planting seed in groups of two or three, with subsequent elimination of homozygous normal individuals. Studies on methods of inducing germination in makapuno nuts are also required.

644. 634.64:576.312.34
POVOLOČKO, P. A. 634.64:576.312.35
Chromosome morphology in *Punica granatum* L.
C.R. (Doklady) Acad. Sci. U.R.S.S. **1937** : **16** : 221–23.
The somatic chromosome number (2n = 16) of the pomegranate was established. Considerable differences in size and morphology were noted among the chromosomes.

SMALL BUSH FRUITS 634.7

645. DARROW, G. M. 634.71:575
Berry breeding.
J. Wash. Acad. Sci. **1937** : **27** : p. 42 (Abst.)
The results of the progress of raspberry and blackberry breeding at Corvallis, Oregon are briefly reported. Hardiness was dominant in the red raspberry crosses and many of the progeny had larger berries than the standard varieties. Data were presented on the inheritance of resistance to "streak" virus disease and other characteristics.
Crosses of the Logan with its wild relatives give fruit with a higher flavour than all other blackberries. The inheritance of thorniness was also considered.

646. SCHWARTZE, C. D. and 634.711.3–2.7–1.521.6
HUBER, G. A. 634.711.3–2.8–1.521.6:575
Aphis resistance in breeding mosaic-escaping red raspberries.
Science **1937** : **86** : 158–59.
Although the variety Lloyd George is susceptible to the mosaic virus, it escapes infection in the field in western Washington by virtue of its resistance to the aphid vector, *Amphorophora rubi* Kalt., which avoids it altogether. Other varieties shewing marked resistance to the vector are Antwerp, Herbert and Newburgh. Resistance can be determined by counts in the field or by placing stem mothers on individual plants under cheesecloth cages.
Lloyd George is able to transmit its resistance in crosses with susceptible varieties, though the mode of inheritance has not yet been determined.

647. 634.715:575.127.2:634.711:576.356.5

(**Notes**).

Bjulleten' Vsesojuznoi Akademii S.-Kh. Nauk im. V.I. Lenina (Bulletin of the Lenin Academy of Agricultural Sciences) 1937 : No. 3 : p. 42.

The Berry Culture Section of the All-Union Institute of Plant Industry has crossed various races of blackberry (2n = 28) with European raspberries (2n = 14). When northern races of bramble were used the F_1 plants (which had 21 chromosomes as the diploid number) were vigorous but bore no fruit and only rarely set a single seed in some of the flowers. In the F_2 however, chromosome reduplication resulted in the production of hybrids that had as their diploid chromosome numbers, 42, 35 and 28 and set fruit. The best (35 chromosomes) as regards yield are undergoing trials under field conditions.

648. Schiemann, E. 634.75:575.127.2:576.312

Artkreuzungen bei *Fragaria* (II). [**Species crossing in *Fragaria* (II).**]

Z. indukt. Abstamm.- u. VererbLehre 1937 : **73** : 375–90.

Crosses were made between the hexaploid *Fragaria elatior* and the two diploid species *F. vesca* and *F. collina*.

When the diploid species were used as the female parent the results were poor. Three plants were obtained from one of the crosses *vesca* x *elatior* with the somatic chromosome numbers 35, 35 and about 105 respectively; the progeny from the other crosses was mostly diploid and pure *vesca*. These results will be dealt with in a later publication.

In the *collina* x *elatior* cross most of the apparently good seeds failed to germinate. From 400 seeds one plant with 2n = 35 was obtained. The results with *elatior* x *vesca* were completely unsuccessful, on the other hand the cross *elatior* x *collina* was relatively easy and produced seeds which germinated fairly well. The F_1 were matroclinous tetraploids which formed 14 bivalents, meiosis was regular and gametes with 14 chromosomes were formed.

All the F_2 progeny so far examined had 28 chromosomes. In whichever direction the cross was made the progeny closely resembled the *elatior* parent. In backcrosses with *elatior* and *collina* the progeny of the latter more closely resembled *collina*. The reduction division of the *elatior* x *collina* hybrids is described and this was on the whole normal. The results correspond very closely with those of Lilienfeld for the cross *elatior* x *nipponica* (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 781). This means that not only the *vesca* genom but also the *collina* genom is homologous with the genoms of *elatior* and either C or V may be taken as the basal genom. The grounds for assuming that *F. elatior* is an autohexaploid from *F. collina* are discussed. It is suggested that the results of these crosses offer an explanation of the "faux hybrides" of Millardet.

649. 634.753 Baron Solemacher

Janson, A. 634.753:575.42

"Baron Solemacher", die neue rankenlose Erdbeersorte. (**"Baron Solemacher", the new strawberry variety without runners**).

Obst, Wien 1937 : **6** : p. 32.

Two forms of the perpetual alpine strawberry, *Fragaria vesca* L. are described, one with red and one with yellow fruits. Both are selections from the original Baron Solemacher, the best runnerless alpine strawberry (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 309), but the tendency in the parent variety to produce fruits with a ripe base and an unripe tip has been overcome.

As these plants can only be propagated by seed, instructions are given for raising the seedlings.

650. Capinpin, J. M. and

Rotor, G. B. (Jr.). 634.774:576.312.35:576.356.5

A cytological and morphogenetic study of some pineapple varieties and their mutant and hybrid derivatives.

Philipp. Agric. 1937 : **26** : 139–58.

The somatic number 50 or the gametic number 25 was found in the majority of the clones studied, which included many F_1 hybrids involving the Hawaiian variety Smooth Cayenne. A clone of Smooth Cayenne studied proved to be triploid with 75 somatic chromosomes

(Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1060) and another clone, No. 14, which was an F_1 hybrid, Red Spanish x Smooth Cayenne, had 60 somatic chromosomes. Clone No. 14 was spineless; a spiny mutant from it had the normal 2n = 50.
Meiosis was apparently normal in the pollen mother cells of the 50-chromosome forms. It was not studied in the 75 and 60-chromosome clones.
It is concluded that 25 is the base number in *Ananas*.

VITICULTURE 634.8

651. WANNER, E. 634.835–2.111–1.521.6:631.541.11
Beobachtungen über die Frostempfindlichkeit verschiedener Unterlagssorten. (**Observations on the susceptibility to frost of various kinds of stocks**).
Wein u. Rebe 1936 : **18** : 129–32.

The severe frost of the winter 1928–29 provided unusual opportunities for observations on the behaviour to cold of various vine stocks. Contrary to the commonly accepted opinion, the American stocks were found to be considerably more resistant to frost than the European varieties.
It was also observed that cuttings taken from some stocks apparently undamaged by frost shewed very low percentages of regeneration. The results indicate that although damage by frost is rare there is considerable variation among the varieties of stocks and the breeder would do well to take this into account.

FORESTRY 634.9

652. 634.97:575
WETTSTEIN, W. v. 634.972.3:575
Forstpflanzliche Züchtungsversuche—besonders mit *Populus*. (**Forestry breeding experiments—especially with *Populus***).
Bot. Notiser 1937 : 272–84.

The importance and possibilities of the improvement of forest trees by breeding methods is illustrated by the author's experiments with *Salix* and *Populus*. The method of using flowering branches of willow, and poplar (kept in water in the greenhouse), for crossing experiments is described and the subsequent methods for treatment of the seedlings.
Interspecific crossing in *Populus* leads in many cases to considerable increase in the height of the hybrids, in other cases dwarf forms result.
Crosses between trees of the same species but from different localities may produce considerable increases in height among the progeny. Crosses have also been successful in producing strains of poplar resistant to *Melampsora populini*. Crosses between *P. canadensis* and *P. pyramidalis* have shewn the dominance of the pyramidal forms of growth and indicate the possibility of producing pyramidal seedlings on their own roots, of producing female plants (the species of *P. pyramidalis* found in Europe are almost exclusively male) and a way of dealing with the so-called "Wipfelsterben" of this poplar.
Breeding experiments with *Pinus silvestris* have shewn that strains exist which are resistant to *Lophodermium pinastri*.
A study of differences in the growth of young trees of *Pinus* suggests that individuals with a low production of wood may produce more abundant cones. A collection of cones for seed may therefore lead to a preponderance of individuals with a high capacity for cone production instead of wood production. This fact may also have an application to other trees. For the production of seed only the best trees are good enough.

653. SYLVÉN, N. 634.97:575(48.5)
Växtförädling av skogsträd. (**The improvement of forest trees**).
K. LandtbrAkad. Handl., Stockh. 1937 : Nr 4 : 423–34.

The progress made in Sweden in the realization of the importance of breeding for the improvement of forest trees is outlined. The main methods employed, direct selection, hybridization, breeding for extreme types and chromosome multiplication are described and their application to some of the main types of forest trees briefly indicated.

654. Wettstein, W. v. 634.972.3:575.42
Individuelle Unterschiede bei Aspensämlingen. (**Individual differences in aspen seedlings**).
Forstarchiv, Z. wiss. tech. Fortschr. Forstw. 1937 : **13** : 149–51.
The advantages to be derived from interpolating sexual propagation in the normally vegetatively propagated plants of poplar are pointed out and illustrated by descriptions of some of the variations shewn by seedlings of *Populus tremuloides*, and of *P. tremula* from different localities.

655. Tometoip, G. 634.972.3:576.356.5
The chromosome numbers of two new giant *Populus tremula*.
Bot. Notiser 1937 : 285–90.
A new giant aspen type found in the province of Medelpad was found to be a triploid with 57 ± 1. Tables are given shewing the results of counts of good and bad pollen and of measurements of pollen diameter.
Another giant aspen is recorded from Vittjärv; in this case the somatic chromosome number was between 50–60 and is also probably triploid.

656. 634.975:576.16
Seitz, D. 634.975:581.44:575
Die Kiefern-Rassenzucht in Theorie und Praxis. II. (**The production of races of Scots pine in theory and practice. II**).
Mitt. Forstwirt. Forstwiss. 1937 : 8:330–39.
The question of races of the Scots pine is further considered (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 793) and with the help of several photographs of the trees themselves and of borings taken through the bole it is shewn that the type of bark in *Pinus sylvestris* is not the result, as Dengler has stated, simply of age and environment but is an inherited character.
Comparative cultures are to be made to test the possibility of selecting élite plants by phenotypic characters.
Selection of mother trees should be based on a combination of all the desirable inheritable characters and not only on provenance.

VEGETABLES 635

657. Boswell, V. R. 635:575(73)
Some recent developments in truck crops research.
Rep. Md Agric. Soc. 1934 : **19** : 254–65.
The part of the article dealing with breeding and selection gives a brief account of vegetable breeding work in the U.S.A., mentioning new varieties of tomatoes, new sweet corn varieties and hybrids, yellows resistant cabbage, wilt-resistant peas, mosaic-resistant and rust-resistant beans, lettuces which will head satisfactorily in the vicinity of Washington D.C., cantaloupes resistant to powdery mildew, sweet potatoes resistant to *Fusarium* wilt, potatoes resistant to mild mosaic, yellows-resistant celery and also celery free from hereditary pithiness or hollow stalk and finally thrips-resistant onions.
Work is in progress by the United States Department of Agriculture in co-operation with about twenty-five State experiment stations on the standardization of varietal nomenclature.

658. Wilson, A. L. 635.25:575
New strains of sweet Spanish onion.
Market Gr. J. 1937 : **60** : p. 218.
Two new strains are described both derived from Riverside Sweet Spanish. One, Sweet Spanish (Utah Strain) is a globe-shaped strain with dark brown, thick, closely adhering skin and brown flesh. It is high-yielding and of good keeping capacity.
The other is a white globe-shaped strain known as Utah White Spanish. It closely resembles the brown strain but does not keep so well.

659. MAEDA, T. 635.26:575.127.2:635.25:576.354.46
Chiasma studies in *Allium fistulosum*, *Allium cepa*, and their F_1, F_2 and backcross hybrids.
Jap. J. Genet. 1937 : **13** : 146–59.
A. fistulosum has localized chiasmata while *A. cepa* has random chiasmata with some terminalization. The F_1 *A. fistulosum* x *A. cepa* had random chiasmata as previously reported (Cf. "Plant Breeding Abstracts", Vol. VI, Absts. 286, 288 and 1418) and irregularities such as univalents and fragments were observed at meiosis.
Bivalents with localized chiasmata were found in 4 out of 13 F_2 plants and in 15 out of 21 plants obtained from the back-cross to *A. fistulosum*, but in every case it was only some of the eight bivalents per cell and not all of them. This is incompatible with the theory that localization is genotypically controlled (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 288).
Data on chiasma frequencies in the parent species and hybrid progenies are given in tabular form. Different individuals in the F_2 and back-cross progenies had different chiasma frequencies.

660. LEVAN, A. 635.26:576.356.2:537.531
Pseudo-bivalent formation in the pollen of *Allium Schoenoprasum*.
Bot. Notiser 1937 : 151–52.
An example of pseudo-bivalent formation in a first pollen grain division is illustrated. The preceding meiosis had been treated with X-rays for 15 minutes. (Cf. "Plant Breeding Abstracts", Vol. VI, Abst. 703).

661. DANIEL, L. 635.261:575.31
L'hérédité acquise chez le poireau bulbifère. (**Acquired inheritance in the bulbiferous leek**).
Ann. Sci. Nat. (10e Sér. Botanique) 1937 : **19** : 125–39.
The occurrence of bulbils in the inflorescence of some leeks planted in a shady spot is noted. When grown, these bulbils produced plants also with bulbils. From seeds, bulbils and cloves of these plants further bulbils were obtained and the inheritance of the acquired character is assumed.

662. BLANK, L. M. 635.34–2.484–1.521.6:575.11
***Fusarium* resistance in Wisconsin All Seasons cabbage.**
J. Agric. Res. 1937 : **55** : 497–510.
Two types of resistance to yellows disease (*Fusarium conglutinans* Wr.) are known in cabbage, type *A*, constant at different soil temperatures and determined by a single dominant factor and type *B*, which breaks down at soil temperatures of or above 24° C. and is more complex genetically. The present studies have shewn that both types of resistance occur in Wisconsin All Seasons, one of the first yellows-resistant varieties of cabbage developed. Type *B* resistance appears to be conditioned by several genetic factors.

663. TIOUTINE, M.-G. 635.6
Le melon-poire. *Solanum muricatum* Ait. (**The melon pear. *S. muricatum* Ait**).
Rev. Hort. Paris 1937 : **109** : 611–15, 643–46.
A description of the plant and of the methods for its cultivation.
The fruit is parthenogenetically produced but the plant is readily multiplied by cuttings.

664. PORTER, D. R. 635.615:575.11
Inheritance of certain fruit and seed characters in watermelons.
Hilgardia 1937 : **10** : 489–509.
The inheritance of flesh colour, seed coat colour, fruit skin colour and rind toughness was studied in watermelon crosses.
Red flesh colour (*R*) was a simple dominant over yellow (*r*). Multiple allelomorphs were found to govern seed colour, *B* giving black, which was dominant over b^t, tan and *b*, white.

Tan was dominant over white. Dark green skin colour was dominant over yellowish-white and incompletely dominant over yellowish-green, giving monofactorial segregation in each case. Striped skin was incompletely dominant over dark green, giving 1 : 2 : 1 segregation in F_2. Rind toughness (*T*) behaved as a simple dominant over rind tenderness (*t*).
The characters were tested in pairs for linkage, but none was discovered.

665. Frimmel, F. 635.64:575(43.7)
Tomatenzüchtung am Mendel-Institut in Eisgrub. (**Tomato breeding at the Mendel Institute in Eisgrub**).
Züchter 1937 : **9** : 173–77.

The system of classification of the collection of 200 varieties is outlined; it is based on fruit colour, form and weight and amplified by further characters.
The first aim in the breeding work, begun in 1912, was a round, smooth tomato with good transport quality and above all, early. Crosses of varieties of the type of Cooper's First Crop with such early varieties as Pomidori Arbanaski and Ficarazzi were used in this work. A method was also developed for the production of F_1 hybrid seed in quantity, so as to utilize hybrid vigour commercially.
In recent times the introduction of field methods of cultivation in place of garden methods and the demand of the preserving industry for pulp rather than for fruits for preserving have changed the objectives of the breeder. Earliness is of less importance, provided the harvest can be completed before the autumn frosts. Hybrid seed becomes uneconomic when seed drills are used instead of transplanting. A large, thick-walled fruit is required with a high sugar content in the sap and, to reduce the labour of plucking, a branched inflorescence is needed. American varieties have been used in breeding for these objectives.
A third method of cultivation, in which the young plants are transplanted, but without receiving the subsequent attention they got in the garden method, allows of the use of hybrid seed. Efforts are being made to develop a fleshy, F_1 hybrid tomato for this type of cultivation.
Other problems of less importance have been worked on, such as the breeding of a small-fruited variety for pickling, with a strongly branched inflorescence so that the fruits can be harvested simply by cutting the whole inflorescence. A white tomato has also been bred.
The aims and methods are set out clearly and briefly in tabular form.

666. Yeager, A. F. 635.64:575.11–181
Studies on the inheritance and development of fruit size and shape in the tomato.
J. Agric. Res. 1937 : **55** : 141–52.

The correlations between number of locules, weight and shape of fruit in various F_2 and back-cross populations were significant, but study of the partial correlations shewed that part of the correlation between shape and weight is due to the association of each with locule number; as the locules increase in number the fruit becomes more oblate and heavier.
The existence of a single major gene for locule number was demonstrated. The dominant, *Lc*, produces 2 or 3 locules, while the recessive *lc*, gives an average of more than $3\frac{1}{2}$. This pair of genes, considered along with the pair *O* (round) — *o* (oval) accounts for much of the variation in tomato shape, thus: *OLc* — round, *Olc* — oblate, *oLc* — oval and *olc* — round.
The locus of *Lc* was shewn to be on the first chromosome, the genes *D*, *S* and *Lc* lying in that order, with a mean cross-over percentage of 20·5 between *S* and *Lc*. Although *Lc–lc* has an effect on size by affecting the number of locules, there are other size genes, since two-loculed, oval varieties are known which differ in size of fruit by several hundred per cent.
With most tomato varieties the shape of the mature fruit is highly correlated with the shape of the ovary at anthesis. The variety Ohio Red, however, has oval fruits not produced by *o* and here a change in shape occurs between anthesis and maturity, caused by some unknown factor or factors producing elongation; their effect is superimposed on that of the gene pair *O–o*.
Some varieties produce pear-shaped fruit and this is probably due to the constricting effect of the fused corolla tube, for if this was removed before anthesis the flowers so treated did not produce pear-shaped fruit.

667. DASKALOFF, C. 635.64:575.125
Beitrag zum Studium der Heterosis bei den Tomaten in bezug auf die Herstellung von Heterosis-Sorten für die Praxis. (Contribution to the study of heterosis in tomatoes in relation to the production of heterosis-varieties for practical purposes).
Gartenbauwiss. 1937 : **11** : 129–43.

The varieties used were Philippopeler, Kurtovsky, Saria, Comet, Holländsche II, Danish Export and Burbank. The technique of cross-pollination is described in some detail. Ripe fruits were harvested at 5-day intervals and, in view of the importance of earliness, the yield from the first five harvests was considered as well as the total yield. The material was grown in fourfold replication in a chequerboard arrangement and the work covered three seasons 1934, 1935 and 1936.

The total yield in the F_1 was greater than the mean of the two parents in every cross and in all years, the increase ranging from 5·48 per cent to 37·24 per cent and varying according to the varieties and the season. The effect of heterosis was more marked if only the yield of the first five harvests was considered. Thus the average increases in total yield in the three years were 22·82, 15·85 and 20·74 per cent respectively, while the increases in early yields were 34·20, 64·86 and 71·25 per cent respectively. In the cross Saria x Comet the increase in early yield averaged 118·23 per cent as against 16·73 per cent for the total yield. This cross and others such as Saria x Holländsche II and Saria x Burbank shewed transgression in F_1 in respect of earliness, while in other crosses the F_1 was intermediate in this respect. The F_1 of Saria x Comet is widely used by Bulgarian vegetable growers as a heterosis variety, excelling other Bulgarian tomato varieties in earliness, yield and quality.

No significant differences between reciprocal crosses were found.

When the yield of the F_2 generation was compared with that of the F_1 in three crosses, it was found that there was a loss in total yield of about 5 per cent on the average, while for the early yield the average loss was 27·3 per cent.

668. GUBA, E. F. 635.64–2.484–1.521.6:575
Tomatoes resistant to *Cladosporium* leaf mold.
Plant Dis. Reporter 1936 : **20** : 258–59. (Mimeographed).

Seeds of resistant hybrids bred by the author are offered for distribution to interested workers in the U.S.A.

669. SHAPOVALOV, M. and LESLEY, J. M. 635.64–2.484–1.521.6:575
635.64 Riverside
A tomato resistant to two wilts.
Phytopathology 1937 : **27** : p. 955. (Abst.)

Certain soils of the Pacific coastal belt of the U.S.A. are infested with *Verticillium albo-atrum* R. and B. as well as *Fusarium lycopersici* Sacc. The variety Riverside has been developed from a cross between Cal 2, somewhat resistant to the former and Marvana, resistant to the latter disease. Riverside combines resistance to both diseases, has a red, round and very firm fruit and is of late maturity.

670. FAJARDO, T. G. 635.64–2.484–1.521.6:575.42
The tomato leafmold (*Cladosporium fulvum* Cke.), a new serious disease of tomato in Baguio, Mountain Province.
Philipp. J. Agric. 1937 : **8** : 163–86.

Data on the reaction of different varieties are given; none was resistant but some were less affected than others. Efforts were made to select resistant strains and from Burpee's Self-Pruning variety a strain with some degree of resistance was produced.

671. Sirks, M. J. 635.652:575.252:575.182
Plasma-Änderung als Ursache einer Knospenvariation. (**An alteration in the plasma as the cause of a bud variation**).
Z. indukt. Abstamm.- u. VererbLehre **1937** : **73** : 367–73.

A bud variation in *Phaseolus vulgaris* var. "Slagzwaard" attracted special attention as most bud variations occur in complicated heterozygotes and *P. vulgaris* is regarded as being more or less homozygous; fruits were produced on the part of the plant shewing the variation and the variation affected quantitative characters. The size of the pods was much smaller than normal and seeds from the three available pods were sown as well as seed from normal pods. The results of sowing the selfed progeny for three generations shewed a gradual return to normal size. Crosses were also made between the normal type and the three strains from the bud variation and the progeny of these crosses shewed a much more rapid return to the normal. The only possible explanation appears to be the assumption that the original bud variation was caused by a temporary plasma alteration which is gradually changed back to the normal.

672. Smith, H. B. 635.652:581.49:519.24
Number of stomata in *Phaseolus vulgaris* studied with the analysis of variance technique.
Amer. J. Bot. **1937** : **24** : 384–87.

Comparable portions of the leaves of two selections of *Phaseolus vulgaris* L. shew many significant differences when the "analysis of variance" technique is applied to the measurements obtained.

The upper epidermis differs in number of stomata per sq. mm. of leaf surface, and in the size of epidermal and guard cells. On the lower surface, however, only the guard cells shew any significant size difference. J. G. H.

673. 635.655
Krasovskii, S. A. 635.655:575(47)
(**The soya bean and its varieties—based on data of official variety trials for 1927-1935**).
Vsesojuznaja Akademija Sel'skokhozjaistvennykh Nauk im V.I. Lenina, Vsesojuznyi Institut Rastenievodstva Gossortoset' (Lenin Acad. Agric. Sci., All-Union Inst. Pl. Ind., Sect. for Regional Variety Trials) Leningrad **1937** : Pp. 104.

Part I of this monograph contains data on variety trials of soya beans in different regions of the U.S.S.R. and various Soviet republics, the results for the various districts being considered from the point of view of quality and reliability of the yield.

Part II deals with varietal differences from the standpoints of length of vegetation period, shattering and height of attachment of the lower pods on the stem. The length of the vegetation period shews great variation especially in different regions and the character is regarded as being not only a varietal characteristic but also one which is conditioned by geographical and ecological factors. In general the length of this period becomes shorter as the cultivation passes from North to South and from West to East. A classification of varieties is given according to their earliness or lateness in the central part of the Azov-Black Sea region.

Shattering, which is explained as due to splitting of the pods during the period from ripening to full maturity and harvesting, is most marked in semi-cultivated and wild plants. In the cultivated forms it has become less pronounced as a result of intentional or unconscious selection. Variety trials have shewn that premature splitting of the pods occurs mainly in the earliest forms and in regions and years in which the season has been driest during ripening. Fortunately the defect is rare and not very marked where it does occur among the varieties tested officially; and some varieties never exhibited it. Nevertheless the character must be considered in the breeding programme.

The height of attachment of the lower pods is important since when the pods grow too low down loss occurs with mechanical harvesting. The existing varieties, except for a few late forms, are unsuited to such methods of harvesting. In general a high position of the pods

occurs mostly in late forms, which are also usually taller than the early ones. The height of attachment of the lower pods exhibits great variation and is dependent not only on the variety but also on cultural factors, such as density of sowing, and even on meteorological conditions of the region of cultivation; but it was not correlated with the geographical location of the various testing stations. Though no deductions could be drawn from data collected on the percentage of highly placed pods per plant, it would seem that the heights recorded are sufficient to prevent loss in the mechanical harvesting of the most promising of the existing varieties. Nevertheless breeding work should be directed towards improving varieties in this respect.

Part III deals with varietal and regional variation in the soya bean and its qualitative characters such as the absolute weight of the seed, the oil and protein content, iodine number and the pigmentation of the seed.

Part IV contains data on a comparison of yields of varieties by regions.

In Part V soya bean breeding is discussed. Though much work has recently been done at Breeding Stations, so far the Amurskaja Station alone has succeeded in producing varieties that have been approved and recommended for commercial use. The importance of combining selection and hybridization is emphasized and a number of stations are now stated to be doing so. The problem of producing economically valuable varieties that are also suitable for use in extending the cultivation of the soya bean must be attacked from the standpoints of the genetics, physiology and biochemistry of the forms used and the theory of phasic development must also be applied.

New varieties produced, from which seed is to be raised, should be early enough in ripening for the regions for which they are intended. The plant should be compact with the lower pods attached high enough on the stem for mechanical harvesting; and they should not be subject to shattering. The seeds should be large and yellow with a hilum of the same colour, should not develop pigmentation and should be well filled. A high content of oil, protein and water-soluble albumens and a high iodine number and low acidity are desirable. The yields should be higher than that of existing varieties and the new forms should be resistant to fungous disease, pests, lodging, fracture of the branches, etc.

"Regional specialization" of varieties can be attained only in regard to the length of the vegetation period, which can be chosen to suit the particular district for which a variety is intended.

A brief outline is given of the development of the production of élite seed from a series of varieties which was begun in 1933.

A supplement comprises a short analysis of variety trials in 1935 and a bibliography.

674. Kvíčala, B. 635.655–2.3–1.521.6
Náchylnost odrůd soji ku bakterielní spále, zjištěná umělou infekcí. (**The susceptibility of varieties of soya bean to bacterial rust determined by means of artificial infection**).
Ann. Acad. Tchécosl. Agric. **1937** : **12** : 266–71.

Soya bean varieties shew differences in their reaction to bacterial rust. Experiments with artificial infection shewed that the most resistant of the varieties tested were Bratislaver yellow Sl. 1, Platter large yellow and Brünner Chmelař's. Further studies are in progress.

BOOK REVIEWS

LEBEDEFF, G. A. 575.1:578.08
Methoden zur Züchtung von *Drosophila*. (**Methods for the breeding of *Drosophila***).

BRIEGER, F. G.
Methoden der Erforschung der Vererbungsvorgänge bei Pflanzen. (**Methods for the study of inheritance phenomena in plants**).

NABOURS, R. K.
Methoden und Ergebnisse bei der Züchtung von *Tetriginae*. (**Methods and results in the breeding of *Tetriginae***).
Handb. biol. ArbMeth. (Emil Abderhalden) 1937 : RM. 17.† Abt. IX, Teil 3, Heft 7 (Schluss) (Lieferung 466) Pp. 1115–1402 + xiii. 50 illus. (Urban & Schwarzenberg, Berlin und Wien).

The German "Handbook of biological technique", is a most ambitious project, published serially, the work under review being No. 466. Section IX of the complete handbook is concerned with methods of investigating the functioning of animal organisms, sub-section 3 with methods of genetical investigation; the part before us is the seventh and concluding part of sub-section 3. As will be seen from the title above it contains three separate articles, of which we are mainly interested in that by F. G. Brieger (pages 1,183–1,308).

Dr Brieger gives a useful and thorough account of the technique of genetical investigations with plant material. The first thirty pages or so deal with the handling of the material, from the sterilization of the soil to the harvesting of the seed. The major part of the article is concerned with statistical methods, the testing of segregations and linkage. There follow some remarks on the special technique of cryptogam investigations and a short chapter on rapid cytological methods. In the first formula given on page 1,209 the root sign should be deleted; this is a rather unfortunate misprint, for though it is unlikely to mislead anybody it tends to weaken the reader's confidence in the less obvious formulae which follow.

The other two articles are also useful accounts, by American workers, of the experimental methods. *Drosophila* is too well-known to require introduction. The *Tetriginae* on the other hand are better known as cytological material and it is possible that results of first rate importance may still be obtained by combined genetical and cytological investigation with these organisms, which have already played a great part in the development of nuclear cytology. As its title indicates, this article (pages 1,309–65) gives more about the results than do the other two, which are more strictly concerned with methods; the article on the *Tetriginae* has a bibliography, the other two have not.

At the end of the book are to be found an index to sub-section 3 and the title pages and tables of contents for binding it in two halves.

CORRENS, C. 575.182
Nicht mendelnde Vererbung. (**Non-Mendelian inheritance**).
Handb. Vererbungsw. 1937 : Lieferung 22 (II H) : Pp. 159. 58 illus. 22 tables. (Gebrüder Borntraeger, Berlin).

This posthumous work of the famous Carl Correns has developed from a survey on the subject given at the 1927 Genetical Congress in Berlin, extended to cover the work up to the end of 1930. Correns died in 1933 and shortly before his death he handed on the manuscript to V. von Wettstein with the request to edit it and by the latter it has been further extended to deal with work published up to 1936. The association of two such worthy names with this book is a guarantee of its value to geneticists and it can be said with confidence that this last, posthumous contribution by Correns will not be considered the least of the many and great services he rendered to the science of heredity.

† 25 per cent reduction outside Germany.

Beginning with a definition of Mendelian inheritance the book goes on to consider the phenomena of "direct carrying-over" and then discusses the behaviour of plastid characters in plants. Here an extensive contribution by von Wettstein shews that the position adopted by Correns needs to be modified somewhat in the light of recent researches on plastid inheritance. Next comes a long chapter on dissimilar reciprocal hybrids, with again a considerable contribution by von Wettstein in which *inter alia* the *Epilobium* work is critically discussed. The next chapter deals with "Ausschaltungsversuche", that is, experiments in which the nucleus from one parent is allowed to develop in maternal or hybrid cytoplasm, the other parental nuclear contribution being excluded. An hypothesis is then put forward to explain the interplay of "genom" and "plasmon". This is to the effect that the capacities for development lie in the cytoplasm (or rather in a special part of it, the "plasmon", which must be considered as a part of the idioplasm lying outside the nucleus) and that the nucleus, the "genom", can only control them quantitatively, that is accelerate, retard or prevent their action. This is in contrast, of course, to the conception of the cytoplasm as affecting the development of characters primarily determined by the genom.
The book concludes with a summary and an extensive bibliography.

WHITE, M. J. D. 576.312
The chromosomes.
Methuen & Co., Ltd., London 1937 : 3s. 6d. Pp. viii + 128. 20 illus. 10 tables.

An outline of nuclear cytology dealing with the resting nucleus, mitosis and its special problems, meiosis and its special problems and with the chromosomes and evolution. While there have been many—one might even say too many—small books published giving an outline of genetics, the dissemination of the many and important results of the study of nuclear cytology has been hindered by the lack of just such a book as this, which therefore fills a noteworthy gap. In his introduction the author expresses the hope that it "will be of use to many biologists who realize that chromosome-cytology has made considerable progress in the last ten years, and that the existing text-book accounts of mitosis and meiosis are hopelessly inaccurate, but who have no time to read the large works of Darlington and Bělař, which must remain the standard sources of information on the subject". After reading the book we can say that this hope is well justified.
The text is clearly written and avoids the use of too many technical terms, the subject matter is up-to-date and the diagrammatic illustrations are for the most part well drawn and helpful. Doubtless owing to considerations of space, the author has been content to assume a fair knowledge of genetics on the part of the reader and the work is therefore especially to be recommended to those who have such a knowledge, in particular plant breeders. There are, however, some minor errors which need to be corrected before the book can be given an unqualified recommendation and we give below those we have noticed: page 30—in a dicentric chromosome the two centromeres of one chromatid at anaphase go to opposite poles with a frequency depending on the distance between them and on the intensity of the relational coiling of the chromatids, therefore not necessarily in 50 per cent of the cases; page 46—aneuploidy is not the opposite of polysomy, which is merely one type of aneuploidy; page 55—if the homologous chromosomes were to separate completely at early diplotene we should have a stage similar not to leptotene but, surely, to a mitotic prophase; page 60—figure 14 shews a chiasma terminalizing not only towards, but apparently past the centromere: the first is unlikely, the second impossible; page 73—it is a debatable point whether allopolyploids are hybrids; page 92—*Aegilotricum* (here called *Aegilotriticum*) is not a wheat-rye hybrid; page 109—the definitions of chiasma frequency are well-nigh meaningless: it would be better to speak of the average number of chiasmata per *bivalent* (or half-chiasmata per chromosome) or per *cell* of a particular organism under given circumstances. It seems a pity that the author is so resolutely against Darlington's term "centromere" for the spindle attachment, for the opportunity is lost of introducing to biologists in general a very convenient system of nomenclature. There are unimportant misprints on pages 51, 86, 92 and 96.
The book is provided with glossary, a bibliography of 189 references and an index.

Brontë Gatenby, J. and
Painter, T. S. (Editors). 578.6
The microtomist's Vade-mecum (Bolles Lee). A handbook of the methods of animal and plant microscopic anatomy.
J. & A. Churchill, Ltd., London 1937 : 10th ed. 30s. 0d. Pp. xi + 784.
11 illus.

Bolles Lee's "Vade-mecum" has so long been the standard work on microscopical preparations that there is no need to recommend it.

The tenth edition has been edited by J. Brontë Gatenby and Theophilus S. Painter with ten collaborators. Many of the chapters have been recast, as for example the chapter on staining which has been done by Dr H. J. Conn. An important innovation in this edition is the introduction of a part, of over 100 pages, on plant technique. This part has been written by Dr D. G. Catcheside and includes a chapter on plant chromosomes. The chapter on animal chromosomes, by Professor Painter, contains much information of interest to the plant cytologist. The extensive index and abundant references in the text are useful features of this, as of earlier editions.

Sirks, M. J. (Editor). 58:061.3
Zesde Internationaal Botanisch Congres, Amsterdam, 2–7 September 1935. Proceedings. Volume I. Report of the activities. (**Sixth International Botanical Congress, Amsterdam, 2–7 September 1935. Proceedings. Volume I. Report of the activities**).
E. J. Brill, Leiden 1936 : Pp. xvi + 450.

Volume II of the Proceedings of the Sixth International Botanical Congress 1935 appeared before the Congress. It contained abstracts of the papers to be read and these were reviewed separately in "Plant Breeding Abstracts". Volume I has been published since the congress and consists of a full account of all the activities which are not covered by Volume II, namely, committees, general meetings, receptions and entertainments, sectional meetings, report on nomenclature, excursions, exhibitions, resolutions, list of delegates, informal meetings, name index (covering both volumes) and photographs. Papers given at the general meetings are reported in some detail and brief accounts are given of the discussions at the sectional meetings. In addition certain papers given at the sectional meetings and which were not reported in Volume II are given here in abstract form. The papers of interest to plant breeders are reviewed below:—

Stakman, E. C. *The problem of specialization and variation in phytopathogenic fungi.* (*pp. 30–35*).

The substance of this paper has already been reviewed (Cf. "Plant Breeding Abstracts", Vol. VII, Abst. 916).

Ernst, A. *Der heutige Stand der Heterostylieforschung.* (*The present position of research on heterostyly*). (*pp. 35–54*).

An account is given of the author's work on heterostyly in *Primula*. Here there are two kinds of styles, long and short, two positions for the anthers, high and low and two sizes of pollen grains, large and small. All the possible combinations of these characters are now known, the normal pin-eyed (long style, low anthers, small pollen) and thrum-eyed (short style, high anthers, large pollen) being therefore only two out of eight types. The generally applicable definition of a legitimate pollination is one in which large pollen falls on a long style or small pollen on a short one. The different combinations are inherited as units and are produced either by closely linked genes or by multiple allelomorphs.

The evolution of dimorphism is discussed in the light of these findings.

Goodspeed, T. H. *Phylesis in Nicotiana.* (*pp. 164–65*).

Studies of meiosis in F_1 hybrids of *N. Raimondii*, *undulata*, *solanifolia* and *paniculata*, all $n = 12$, reveal differences in their genoms leading to the formation of unequal bivalents and multivalent associations. Differences exist also between the *undulata* genom and the *undulata* sub-genom of the amphidiploid species *N. rustica* ($n = 24$).

Stein, E. *Ueber neuere Fragen der experimentellen Gen-Mutation. (On recent problems of experimental gene mutation). (pp. 174–76).*

After an outline of some of the theoretical results of work on X-ray induced mutation, an account is given of the hereditary cancer induced by radium treatment of *Antirrhinum*. This is also due to mutation—of a gene directly affecting cell mechanisms.

Goodspeed, T. H. *Significance of mutation induced by high frequency radiation in Nicotiana species. (pp. 176–78).*

The cytogenetic effects of X-ray and radium treatments of *Nicotiana* species are discussed under the headings: visible chromosome alterations, unstable chromosome mechanisms and asynapsis.

Rasmusson, J. *Some inbreeding problems. (pp. 181–85).*

The author suggests that further investigation is needed to verify the theory explaining heterosis in terms of linkage and dominant favourable characters and points out that this theory is apparently inadequate in some respects.

Möbius, M. 58:9

Geschichte der Botanik von den ersten Anfängen bis zur Gegenwart. (**History of botany from the first beginnings to the present day**). Gustav Fischer, Jena 1937 : Unbound RM. 18. Bound RM. 20.† Pp. vi + 458.

For one man to write a history of botany which will adequately cover the whole subject from the first beginnings to the present day is a super-human task, for the subject has now become so extensive that a mere review of the modern advances would be a formidable undertaking. It is therefore not surprising that, while the history of botany up to the beginning of the twentieth century is dealt with in some detail, when it comes to the present day the treatment is sketchy and very incomplete.

There is also the very natural and probably unconscious tendency to dwell most fully on German work and German workers and to select from among foreign literature the less representative work. A notable defect is the lack of adequate references. When an author is quoted the reader may or may not be referred to foot-notes which in most cases give the date of the author's birth and death and only very occasionally a reference to the relevant literature.

There is no bibliography and no subject index, only an index of authors.

The greater part of the book is taken up by the division headed "Scientific Botany" in which separate sections are devoted first to the lower organisms up to the Angiosperms and then with the various branches of cytology, morphology, physiology, etc. There is a short division for applied botany and one for miscellaneous subjects such as Botanical Gardens, textbooks and microscopic technique, etc.

Iversen, J. 581.5

Biologische Pflanzentypen als Hilfsmittel in der Vegetationsforschung. Ein Beitrag zur ökologischen Charakterisierung und Anordnung der Pflanzengesellschaften. (**Biological plant types as aids in ecological investigation. A contribution to the ecological characterization and arrangement of plant associations**). Levin & Munksgaard, København 1936 : 8.00 kr. Pp. 224. 12 figs. 56 tables.

Each plant species possesses an ecological individuality which can be used as an indicator of the ecological conditions. A knowledge of the ecological value of the various meadow plants as indicators provides a means by which the various meadow types can be separated from each other and classified on an ecological basis.

To this end the different plant types and associations are analysed and then the use of the biological plant types for an ecological characterization and arrangement of the plant communities is considered.

581.6:030.8
HOLLAND, J. H. 633/5
Overseas plant products.
John Bale, Sons & Curnow, Ltd., London. 1937 : 6s. 0d. Pp. vii + 279.

This dictionary of economic plants deals mainly with those of overseas origin which are imported on a commercial scale into the United Kingdom, though others of economic value in the country of production are also included and even those which are in process of domestication or being considered as possible economic plants are not ignored e.g. tau-saghyz and *Mundulea*. The book is founded on a list compiled by the author while working in the Museums Department at the Royal Botanic Gardens, Kew, and has been completed since his retirement. It is clearly the work of a most competent hand and the author deserves the gratitude of everybody connected with economic botany for assembling such a valuable work of reference.

The common name, Latin name and natural order of each plant is given, together with a brief note on the use of the product and the countries of origin. There are abundant cross-references and enumerations of the particular products dealt with under such general headings as Beans, Citrus, Drugs, Fibres, Fruits, etc., etc. An extensive bibliography provides the sources where further information is to be obtained, while in the introduction, references are given to the official reports giving statistics and conditions governing imports and exports.

The modest price deserves mention.

SNELL, W. H. 632.4:030.8
Three thousand mycological terms.
Publ. No. 2 Rhode Island Botanical Club, Providence, R.I. 1936 : Pp. 151. 12 pls.

This dictionary of over 3,000 terms has, according to the author's foreword, developed from a small glossary prepared for the use of students in a course in Mycology at Brown University, Rhode Island. In addition to the technical terms used in college courses it is intended to give the special meanings of technical and ordinary words and phrases used particularly in describing the agarics, boletes and polyspores, for the benefit of amateur mycologists interested in these higher fungi. Certain of the terms are illustrated in 12 plates at the end of the book by H. A. C. Jackson and the colour terms are accompanied by descriptions as well as references to works on colour nomenclature.

632.482
GROVE, W. B. 632.483
British stem- and leaf-fungi (*Coelomycetes*). A contribution to our knowledge of the fungi Imperfecti belonging to the *Sphaeropsidales* and the *Melanconiales*. Volume II.
Cambridge University Press 1937 : 21s. 0d. Pp. ix + 406. 133 figs.

The first volume of the author's monumental work on the British *Coelomycetes* was published in 1935 (Cf. "Plant Breeding Abstracts", Vol. VI, p. 99) and the present volume completes the work, dealing with the remaining *Sphaeropsidales* and the *Melanconiales*.

The main part of the book follows the same scheme as Volume I. At the end of the book are certain addenda to Volume I, Latin diagnoses of 21 new species and 3 new genera described in Volume II, an epilogue, some verses to "*Phomopsis perniciosa*, an adventurous *Coelomycete*", an index of those *Ascomycetes* to which the coelomycetous fungi have been assigned by various authorities, an index of hosts, an index of binomial names, a brief additional note on *Diplodia* and finally a list of the most important of the authorities' names with their abbreviations. The author's name is sufficient recommendation of this, which can hardly fail to become a standard work. His personality finds expression in his notes following the description of each species and especially in the epilogue, where he incidentally coins two terms not to be found in the "Three Thousand Mycological Terms" reviewed elsewhere in these pages—"Nomenclatorialism—An intricate esoteric art which strives to affix to every living creature (plant or animal) a definite unchangeable Latin label" and "Petripatellism—The stage of

mind of a mycologist who studies his fungus in a laboratory, on agar slants or *Petri-dishes*, without paying equal regard to what the fungus can do out of doors". The verses express the author's disapproval of the accordance of specific rank to a parasite of fruit trees under the name *Phomopsis perniciosa*, which he believes is only a mutation of some previously existing, but less noticeable parasite. We cannot forbear to quote one verse; the mutant spore soliloquises:—

"Adventures to th' adventurous!
I've planned a selfish joy
(From some small change of genes in me)
These orchards to destroy".

Wood, R. C. 63:551.566.1
A note-book of tropical agriculture.
Imp. Coll. Trop. Agric., Trinidad 1937 : 2nd ed. 5s. 0d. Pp. iv + 147.
The second edition of this handy little note book, which contains within a small compass information usually scattered throughout innumerable text books has received some few alterations which should add further to its usefulness.

633.00.14(43)
Richtlinien für die Durchführung von Sortenversuchen. (**Directions for the carrying out of variety tests**).
Reichsnährstand, Berlin 1936 : Pp. 51.
Official instructions are here given for those carrying out variety tests in Germany and include the conditions necessary for the research such as the seed supply, yield tests, etc.; the methods to be employed; general instructions and finally detailed instructions for each crop.

Pearse, N. S. 633.51(81)
Cotton progress in Brazil.
International Federation of Master Cotton Spinners' & Manufacturers' Association 1937 : Pp. xvi + 183. illus. tables.
This account of cotton production in Brazil to-day is in the nature of a report on a visit made by the author on behalf of the International Cotton Committee and lasting some five weeks. The first nine chapters deal with Brazilian cotton in general, giving a brief account of conditions in the country, the history of cotton cultivation in Brazil, climate, varieties, ginning laws, cotton presses, classification service, cost of production and pests. In the tenth chapter, which forms the larger part of the book, the different states are treated individually.
In addition to the general picture of Brazilian cotton production, much useful data are given in tables, while the author's critical comments will be of value from a commercial point of view. The plant breeder will be interested in the accounts of experimental work, much of which is breeding, and also in the governmental efforts to control seed distribution.
The book is illustrated by photographs and maps and in two appendices are given an estimate of the cotton crop, 1936–37 and a list of ginneries in São Paulo with their registration marks. Despite a number of errors which might have been corrected in the proofs, the work is most useful in giving a survey and detailed information which might otherwise be accessible only with difficulty.

Schmidt, H. 633.584.3:575
Zucht und Anbau von Korbweiden. (**Breeding and cultivation of basket willows**).
Reichsnährstand Verlags-Ges.m.b.H. Berlin 1937 : RM. 1.20† : Pp. 50. 9 illus.
The decline in the demand for supplies of basket willows is to be traced to the unsatisfactory state of the product which in turn is due to the impurity of the material available for the grower. All indigenous willows have become mixed as the result of natural crossing. Only

Salix americana imported from America is an exception. In 1923 the author grew some plants of a so-called pure variety only to find that such a thing did not seem to exist. Four hundred good quality mother trees of one variety were then grown. Of these each provided a class of its own which, however, proved to be constant.

It is therefore necessary in breeding basket willows to proceed as with other economic crops, with the production of pure lines. Certain species of willow, *S. viminalis*, *S. amygdalina*, *S. purpurea*, *S. dasyclados*, *S. americana* and *S. acutifolia* are briefly described and their possibilities for breeding purposes are indicated.

The methods of cultivation and the diseases and pests of the willow and their control are described.

CIUPKA, P. 633.73

Kaffee. Ein Lehrbuch in enger Anlehnung an die Praxis. (**Coffee. A textbook in close relation to practice**).

Otto Meissners, Hamburg 1937 : 3.60 gold marks.† Pp. 77.

Coffee is here considered from the point of view of the man in the trade. The terms used in the trade to denote the different kinds of bean are described and there is a very general account of the botany and cultivation of the plant from the same aspect.

A short section is devoted to the chemistry and physics of the bean. The section on raw coffee contains descriptions of the kinds of coffee recognized by the trade.

An account is given of the processes involved in the manufacture of the final product and there is a short section on the statistics of coffee.

HOOPER, D. 633.88(55 + 56.7)

Useful plants and drugs of Iran and Iraq.

Field Mus. Publ. 387 (Bot. Ser.) 1937 : 9 $1.50. Pp. 71–241.

The plants of Iran and Iraq are listed alphabetically under their Latin names. The local names are given and the uses of the plant are described. This is followed by two short lists of drugs of mineral and animal origin and their uses and finally some local prescriptions are given from Isfahan, Iran.

There is an alphabetical list of native names with Latin equivalents.

The rapid westernization of Iran makes the preservation of such primitive medical folklore of considerable value.

LAWRENCE, W. J. C. 634/5:575

Practical plant breeding.

George Allen & Unwin, Ltd., London 1937 : 5s. 6d. Pp. 155. 34 figs.

As described in the author's preface, the aim of this small volume is "to outline in simple terms the scientific background of plant breeding, and to provide a concise and reliable guide for the practical man", being in this case a gardener.

The first two chapters deal with the structure of flowers and pollination and fertilization, while in the third chapter, entitled "the technique of breeding", the practical details of the control of pollination, records, labelling, harvesting, pedigree numbers and scoring are given. Chapter 4 deals with the laws and Chapter 5 with the mechanism of inheritance; together they contain a brief and clear account of elementary Mendelism and the chromosome theory of heredity, polyploidy, linkage, structural and gene mutation being included in the latter. The next chapter deals with the important problems of sterility and incompatibility; among the methods given for overcoming sterility is the decapitation-callus method of inducing chromosome doubling as applied to tomatoes. Chapter 7, on methods of plant improvement, instructs the reader in the application of the information given in the preceding chapters. The final chapter gives a brief account of the results of plant breeding. The book concludes with a short bibliography and an index.

As Sir Daniel Hall says in his foreword, Mr Lawrence is peculiarly well fitted to write a book of this kind and the work can be confidently recommended.

TOUMEY, J. W. and
KORSTIAN, C. F. (revised by). 634.9
Foundations of silviculture upon an ecological basis.
John Wiley & Sons, Inc., New York 1937 : 2nd ed. 22s. 6d. Pp. xxi + 456. 22 figs. (Chapman & Hall, London).

During the seven years which have elapsed since the publication of the first edition the advances in forestry, ecology and plant physiology have necessitated considerable revision of the original material. Chapters have been rewritten and re-organized and new matter has been included though every effort has been made to retain as much as possible of Professor Toumey's original material.

The present volume is divided into three parts. Part I, *Environment of the forest*, Part II, *Influence of the forest on its environment*, Part III, *The forest*. There is also an appendix giving the common and technical names of trees and the references are now collected together into a bibliography covering 31 pages.

SEVENTH INTERNATIONAL CONGRESS OF GENETICS.

In accordance with a resolution of the International Committee and with the decision of the Organizing Committee elected by the Genetical Society of Great Britain, the VIIth INTERNATIONAL CONGRESS OF GENETICS will meet in Edinburgh in 1939, probably from 23rd–30th August inclusive. Professor F. A. E. Crew, Institute of Animal Genetics, University of Edinburgh, Edinburgh, 9, has been appointed General Secretary to the Congress and to him all correspondence concerning it should be addressed.

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